APOSTLE ISLANDS NATIONAL LAKESHORE

Draft

FIRE MANAGEMENT PLAN ENVIRONMENTAL ASSESSMENT

February, 2005

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INTRODUCTION

Apostle Islands National Lakeshore (NL) was established to "conserve and develop the geographic, scenic, and scientific values of the Apostle Islands for the benefit, inspiration, education, and enjoyment of the public" (Public Law 91-424, 1970). The Park is extremely valuable as a scientific resource for several reasons. There are numerous unique natural features on the islands including geological types and formations, and rare ecological communities such as lagoons and perched bogs. In addition the islands support one of the few protected areas in the Lake Superior Basin with old-growth forest remnants. These areas and others provide the opportunity for long-term ecological studies in an undisturbed setting.

The Park also protects outstanding historic and cultural features. Among these are a collection of historic lighthouses widely considered to be the nation's finest, and an array of historic and archeological sites illustrating at least 17 centuries of Native and Euro-American occupation: prehistoric campsites, pioneer farmsteads, deserted stone quarries and logging camps, the island dwellings of fishermen and wealthy businessmen.

Authorities for establishment and management of Apostle Islands National Lakeshore are found in the following laws:

- An Act to provide for the establishment of the Apostle Islands National Lakeshore, September 26, 1970, Public Law 91-424 (84 Stat. 880).
- An Act to authorize the inclusion of certain additional lands (Long Island) within the Apostle Islands National Lakeshore, October 17, 1986, Public Law 99-497.

The Park General Management Plan (GMP 1989) states that, "in general, the long-term natural resource objective of the National Park Service (NPS) is to restore and maintain the biologic diversity of the dynamic ecosystem that would exist today had not human activities such as logging intervened." and that "Fire will be considered as a tool in the management of forest vegetation and wildlife. Fire management recommendations could include prescribed fires and wildland fire use policies." General Management Plan goals related to fire management include:

- Study, protect, interpret, and manage the Park's natural resources in accordance with legislative and executive requirements and NPS Management Policies.

- Identify, inventory, preserve, protect, and interpret to the public the Park's cultural resources in accordance with legislative and executive requirements and NPS historic preservation policies.

- Rehabilitate, where appropriate, resources and processes recently altered by human activities. Use natural or simulated natural processes whenever possible.

- Manage islands found to be suitable for wilderness designation under the Wilderness Act of 1964 so as not to impair their wilderness qualities, pending Congressional consideration of wilderness designation.

The Park's General Management Plan (GMP) is currently undergoing revision. The updated plan is scheduled to be completed in 2008. Until that time, the Park will continue to operate under the guidance of the 1989 GMP.

The Park completed a wilderness suitability study in the spring of 2004 and late in the year approximately 80% of the Park was designated as wilderness.

The Park's resource management goal related to fire is to protect and maintain cultural and natural resources and wilderness values by allowing this natural disturbance process to maintain fire-dependent and fire-initiated ecosystems of the Park. This will allow for the restoration, maintenance, and enhancement of ecological integrity and biodiversity, and the achievement of the desired future condition for the Park which is the presettlement (before 1850) vegetation of hemlock/white pine/northern hardwood forests (see Appendix H for scientific names) and other known island ecosystems. Other goals include reducing the potential of fire that would potentially threaten Park resources and infrastructure, and the reduction of unnatural ground fuel loading. Initially, the strategy would use prescribed fire and non-fire applications to restore fire to areas where it has been eliminated due to past suppression policies and where hazardous fuels conditions exist that threaten valuable natural and cultural resources, and infrastructure. Once fire restoration has been accomplished and fuels have been reduced to acceptable levels, wildland fire use would be the primary means of maintaining Park nature fire regimes.

It is recognized in the proposed Fire Management Plan (FMP) that there is a need to move towards a more holistic fire management approach. This involves the designation of fire management units to implement wildland fire use and fuels management (prescribed fire and non-fire applications) programs in combination with suppression to meet resource management objects. Other goals include the following:

- Cooperate and consult with adjacent land owners and land/fire management agencies for an integrated approach to fire management.
- Develop and maintain short- and long-term monitoring programs for consistent application of fire strategies and to determine the effectiveness of the fire management program.
- Develop public programs to explain fire's role in natural ecosystems and for public safety.
- Protect human life, public and private property, and irreplaceable natural and cultural resources from unwanted wildland fire.
- Develop a proactive fuel-reduction program to minimize the risk of fire to the most highly vulnerable cultural resources.

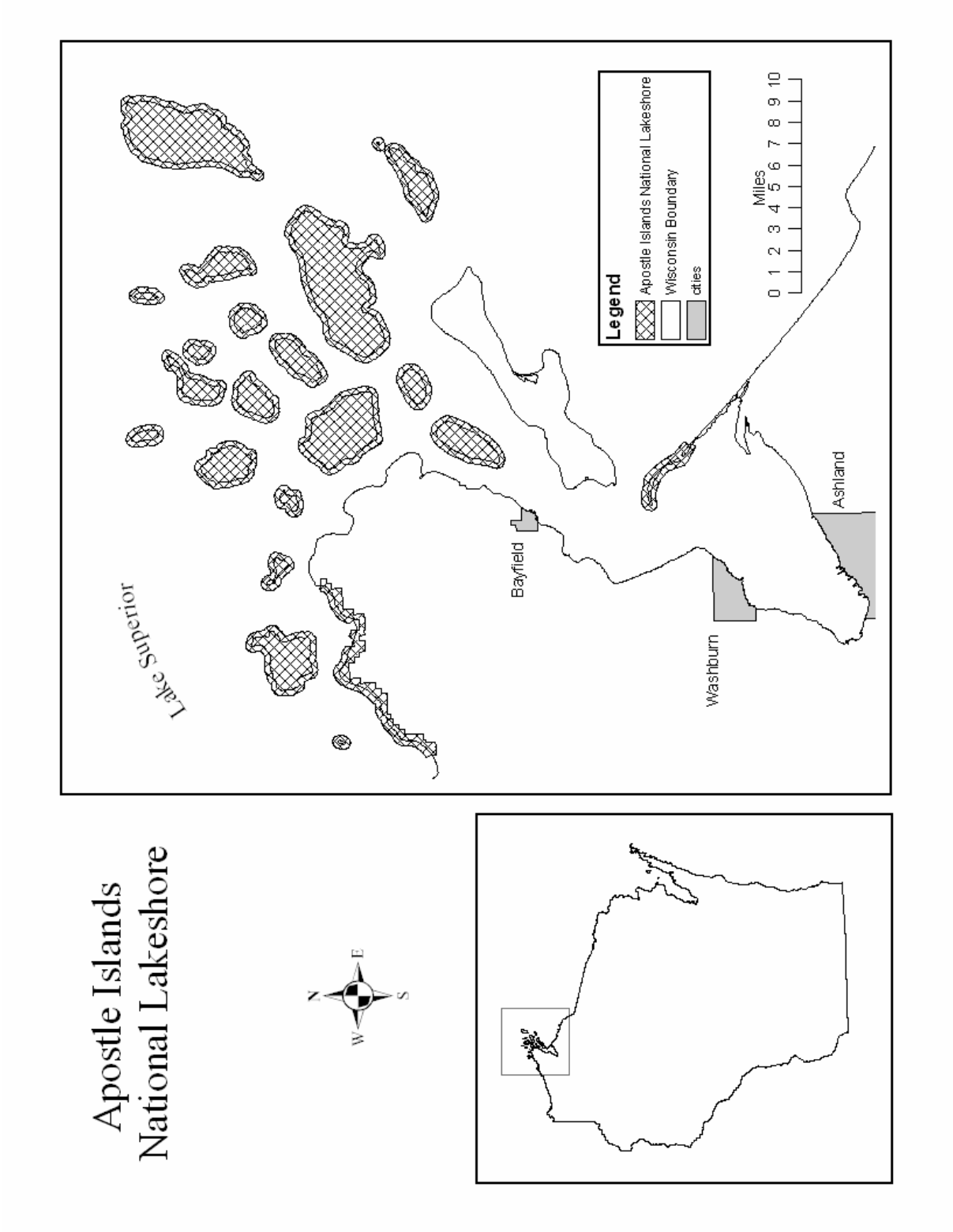

Figure 1.0-1. Apostle Islands National Lakeshore

- Use minimum impact fire suppression techniques and rehabilitate disturbed areas to protect natural, cultural, and scenic resources and wilderness values from adverse impacts attributable to fire suppression activities.
- Allow fire to play its natural role as an ecosystem process which will sustain biodiversity by creating natural plant mosaics and wildlife habitat.
- Use wildland fire use and prescribed fire in combination with other forest ecological methods to restore rare or extirpated presettlement vegetation communities such as island interior white pine forests or to form buffers around valuable resources.
- Use prescribed fire with other methods to restore and maintain cultural landscapes.
- Use wildland fire use and prescribed fire to mitigate hazardous fuels conditions. This would lessen the possibility for resource damage due to large fires.

1.1 Purpose and Need for Federal Action

This Environmental Assessment (EA) documents the results of a study of the potential environmental impacts of an action proposed by the National Park Service to develop an Apostle Islands National Lakeshore Fire Management Plan (FMP).

This EA has been prepared in compliance with:

- The National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.), which requires an environmental analysis for major Federal Actions having the potential to impact the quality of the human environment;
- Council of Environmental Quality Regulations at 40 Code of Federal Regulations (CFR) 1500-1508, which implement the requirements of NEPA;
- U.S. Department of Interior Conservation Planning, Environmental Impact Analysis, and Decision Making; Director's Order #12 and Handbook;
- National Historic Preservation Act, 1966 and as amended.

The Purpose of an Environmental Assessment (EA)

An EA study is performed by a Federal agency, such as the National Park Service, to determine if an action they are proposing to implement would significantly affect any portion of the environment.

The intent is to provide project planners and Federal decision-makers with relevant information on a Proposed Action's potential impacts to the environment.

If the study finds no significant impacts, then the agency can publish a Finding of No Significant Impact (FONSI) and can proceed with the action. If the study finds there would be significant impacts, then the agency must prepare and publish a detailed Environmental Impact Statement (EIS) to help determine how to proceed with the action.

Two key objectives of NEPA are to help Federal agency officials make well-informed decisions about agency actions and to provide the general public with opportunities to provide input to the decision-making process both at the scoping and public review stages. The study and documentation mechanisms associated with NEPA seek to furnish decision-makers with sound knowledge of the comparative environmental consequences of the several courses of action available to them.

Nothing in the Fire Management Plan or its implementation is intended to modify, abrogate or otherwise adversely affect tribal reserved rights.

1.1.1 Need for Action

The Apostle Islands National Lakeshore does not have a Fire Management Plan which is required by Director's Order-18 before a wildland fire management program can be fully implemented. The use of either prescribed fire or wildland fire is expressly not permissible without an approved plan. Subsequently, all wildland fires have been suppressed in the Park since the Park's establishment in 1970.

There is a need to incorporate recent directives into the Park's fire program. The Final Report of the Federal Wildland Fire Management Policy and Program Review (1995 USDI Bureau of Indian Affairs, Bureau of Land Management, National Park Service, Fish & Wildlife Service, and USDA Forest Service) provides guiding principles that are fundamental to the success of the Federal Wildland fire management program. These recommendations include Federal Wildland fire policies in the areas of: safety, planning, wildland fire, prescribed fire, preparedness, suppression, prevention, protection priorities, interagency cooperation, standardization, economic efficiency, wildland/urban interface, and administration and employee roles. The 2001 Fire Management Policy (USDI Bureau of Indian Affairs, Bureau of Land Management, National Park Service, Fish & Wildlife Service, and USDA Forest Service) update addresses 17 distinct items, the foremost being safety; all Fire Management Plans (FMP) and activities must reflect this commitment.

The 2001 policy that governs wildland fire management provides for a full range of responses and the opportunity for wildland fires (wildland fire use or wildland fire use). This policy represents a significant departure from past fire management practices. All ignitions occurring in wildland areas are now classified as wildland fires or prescribed fires (NPS, 1998a). Wildland fires include any non-structure fire, other than prescribed fire, that occurs in the wildland, regardless of whether the origin is natural (generally lightning) or human (accident or arson). All wildland fires not naturally ignited, as well as any wildland fire not capable of supporting resource management goals and objectives, will receive a suppression response. Prescribed fires include any fire ignited by management actions to meet specific objectives. This term replaces management-ignited prescribed fire. Prior to the ignition of prescribed fires, a written, approved prescribed fire plan must exist, and NEPA requirements must be met. This EA constitutes the requisite NEPA documentation and compliance for the FMP.

There is a need to meet General Management Plan direction to restore and maintain biological diversity of the ecosystem that would exist today had various land use practices not intervened over time.

There is a need for Apostle Islands National Lakeshore to develop a Fire Management Plan and program to support a broad range of resource management objectives, including the restoration of fire as a natural ecological process. Both wildland fire use and prescribed fire are needed at Apostle Islands to achieve resource management goals. In addition, in some areas there is a need

to reduce fuel loadings near cultural resource sites and NPS facilities using mechanical treatment methods.

1.1.2 Purpose for Action

The purpose of this Federal action is to provide a long-range fire management plan and program at Apostle Islands National Lakeshore utilizing the benefits of fire to achieve desired natural resource conditions while protecting human lives, Park resources and surrounding lands and property from fire. These desired conditions are described in the GMP and include those that would have occurred had various land use practices not occurred over time. Specific goals for fire management include allowing the natural disturbance process of fire to function in the Park's ecosystems, facilitating ecological community restoration, reducing unnatural accumulation of fuels, restoration of cultural landscapes, and cultural and natural resource and infrastructure protection.

1.1.3 Proposed Action

The proposed action is to implement a long-range fire management plan. This environmental assessment (EA) analyzes a range of long-range fire management program alternatives and their direct, indirect, and cumulative impacts to the environment of Apostle Islands National Lakeshore. Three alternatives are analyzed; Alternative A; No Action, Alternative B; Implement wildland fire use; and Alternative C, adoption of a fire management program utilizing wildland fire use and prescribed fire. Alternative C is the National Park Service's preferred alternative. This includes suppression of all human-caused fires, wildland fire use to accomplish specific pre-stated resource management objectives, and use of prescribed fire and non-fire applications to meet resource management objectives where wildland fire use would be inappropriate.

1.2 IMPACT TOPICS SELECTED FOR ANALYSIS

1.2.1 Air Quality

The Federal 1963 Clean Air Act stipulates that Federal agencies have an affirmative responsibility to protect a Park's air quality from adverse air pollution impacts. Apostle Islands is a Class II area, and as such afforded a degree of protection under the Clean Air Act. While the Park generally enjoys exceptional air quality, it is not pristine air quality. Fires generate smoke and particulate matter, which will impinge on air quality in the Park and surrounding region to some extent. Moreover, the extensive forests in both the U.S. and Canadian portions of this border region are subject to both natural and human-caused fires, as well as prescribed fires. All of these considerations recommend the inclusion of impacts to air quality in this analysis.

1.2.2 Water Quality

NPS policies require protection of water resources consistent with the Clean Water Act. Both water quantity and water quality are important issues at Apostle Islands. Both fires and fire

suppression efforts can adversely affect water resources by exposing soils, which leads to erosion during storm events and subsequent suspended solids and turbidity in downstream surface waters. Therefore, impacts to water resources are analyzed in this EA.

1.2.3 Geology and Soils

Preserving geologic conditions is one of the purposes listed in the enabling legislation of Apostle Islands. The physical structure of geological resources can be impacted by heavy equipment associated with suppression efforts. Soil productivity and fertility can potentially be adversely affected by intense fires as well as by suppression activities. Therefore, impacts to geology and soils are analyzed in this EA.

1.2.4 Floodplains and Wetlands

Presidential Executive Orders 11988 and 11990 mandate floodplain management and protection of wetlands. The Park contains floodplains and wetlands including bogs, lagoons, marshes, swamps, and vegetated Parks. These wetland communities support considerable biodiversity. Fires and to a lesser extent fire suppression activities have the potential to influence the area and function of floodplains and wetlands as well as the viability (capable of living and developing under favorable conditions) of associated flora and fauna, and therefore impacts to both are analyzed in this EA.

1.2.5 Vegetation

This section addresses both the larger scale of ecological communities and the smaller scale of individual species. Apostle Islands contains several unique examples of both ecological communities and species of vegetation. Much of the Park's target condition relates to the status of its forests. The structure and composition of the Park's forests is a key element in the types and quality of wildlife habitat present in the Park. Therefore, this EA will consider the impacts of the proposed FMP alternatives on the Park's vegetation at the larger community type scale and at the smaller plant species scale. Communities will be evaluated based upon whether the alternatives would shift the composition outside of its natural range of variability.

1.2.6 Natural Processes

Natural disturbances such as fire and wind and their frequencies, and nutrient cycling associated with coarse woody debris have a strong influence on the natural communities, vegetation, and wildlife found in the Park. These processes can both be affected by fire and fire suppression. Therefore this EA will consider the impacts of the proposed alternatives on the type, frequency, and location of natural disturbances, and the amount of coarse woody debris by community type.

1.2.7 Fuels

The amount and distribution of fuels affects how a fire behaves. Fire behavior is directed related to decisions about how fire is managed. Therefore fuel types will be considered in this environmental assessment.

1.2.8 Rare, Threatened, and Endangered Species

The Federal Endangered Species Act prohibits harm to any species of fauna or flora listed by the U. S. Fish and Wildlife Service (USFWS) as being either threatened or endangered. Such harm includes not only direct injury or mortality, but also disruption of the habitat on which these species depend. Section 7 of the Act also requires Federal Agencies to consult with the Fish and Wildlife Service when any activity permitted, funded, or conducted by that agency may affect a listed species or designated critical habitat, or is likely to jeopardize proposed species or adversely modify proposed critical habitat. Apostle Islands National Lakeshore offers refuge to several Federal and state threatened and endangered species, including the bald eagle, piping plover, and timber wolf, as well as a number of Wisconsin state species of special concern. Since these species depend on habitat conditions that may be influenced by fire or fire exclusion, this EA considers the effect of the FMP on direct mortality, habitat alteration, or viability of threatened and endangered species known to occur in the Park.

1.2.9 Wildlife

Enabling legislation for Apostle Islands requires conservation and recreational enjoyment of the Parks natural resources. The Park contains a number of species of wildlife, particularly birds, which are both uncommon and widely appreciated by the American public. Furthermore, fire management has pronounced effects on the forested wildlife habitat that predominates in the Park, and thus indirectly on wildlife populations. Wildland fires can impact wildlife directly through mortality, or indirectly through alteration of behavior and habitat modification. Fisheries can be indirectly impacted if erosion and turbidity occur subsequent to fires or suppression efforts. Therefore, impacts of the FMP alternatives on the viability of wildlife and fisheries are evaluated in this EA.

1.2.10 Wilderness

The 1964 Wilderness Act states that wilderness, “in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.” This statute established a National Wilderness Preservation System; designated areas in that system are to be left unimpaired for future use and enjoyment. Approximately 80% of Apostle Islands National Lakeshore has been designated as wilderness, and is managed so as not to have the potential to impact its wilderness qualities. Both fires and fire suppression impact wilderness values, and as such, the impact of the proposed FMP alternatives on wilderness character will be analyzed in this EA.

1.2.11 Soundscapes

Noise is defined as unwanted sound. Fuel reduction, prescribed fires and fire suppression efforts can all involve the use of noise-generating mechanical tools and devices with engines, such as chain saws, trucks, helicopters, and airplanes. Each of these devices, in particular helicopters and chain saws at close range, are quite loud (in excess of 100 decibels). NPS management policies call for the preservation of, "to the greatest extent possible, the natural soundscapes of Parks" (NPS 2000, Section 4.9). Furthermore, with 80% of the Park proposed for wilderness designation, and managed so as not to impair its wilderness qualities, Apostle Islands must consider potential impacts of motorized equipment to the character, aesthetics, and traditions of wilderness (NPS 2000, Section 6.3.4.3). Therefore, noise is addressed in this EA.

1.2.12 Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) of 1966 provides the framework for Federal review and protection of cultural resources, and ensures that they are considered during Federal project planning and execution. Human occupation and use of the Park spans two millennia, and valuable archeological and ethnographic resources, historic structures and cultural landscapes are found within the Park. These cultural resources can be affected both by fire itself and fire suppression activities. Thus, potential impacts to cultural resources will be addressed in this EA.

1.2.13 Socioeconomics

Forestry and industry (pulp and paper), the traditional mainstay, continue to be important in the region, but are relatively stagnant. Tourism is also an important and growing part of the economy, especially in the Bayfield Peninsula. The Park itself represents a substantial contribution to regional tourism. To the extent that fires influence the surrounding environment in ways that matter to tourists, they can affect the regional economy. Smoke, aesthetic and visual effects and damage to property all represent means by which the socioeconomic environment can be impacted by fire. Also, fighting wildfires can generate short-term boosts to local employment and spending. Thus, this EA will consider the impact of the proposed FMP and alternatives on socioeconomics.

1.2.14 Human Health and Safety

Fires can be extremely hazardous, even life-threatening, to humans, and current Federal fire management policies emphasize that firefighter and public safety is the first priority; all FMPs must reflect this commitment (NIFC 1998). Therefore, impacts to human health and safety are addressed in this EA.

1.2.15 Visitor Use and Experience

The 1916 National Park Service Organic Act directs the Service to provide for public enjoyment of the scenery, wildlife, and natural and historic resources of national Parks "in such a manner

and by such means as will leave them unimpaired for the enjoyment of future generations." The enjoyment and education of visitors are emphasized in Apostle Island National Lakeshore's purpose and mission statements. Therefore, the potential impacts of the proposed FMP on visitor use and experience are addressed in this EA.

1.3 IMPACT TOPICS ELIMINATED FROM FURTHER EVALUATION

1.3.1 Environmental Justice

Executive Order (EO) 12898 gives a general directive that each agency identify and address, as appropriate, "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations". If the analysis shows that the actions proposed will affect minority or low-income thresholds, additional analysis, mitigation or study may be required.

The U.S. Census Bureau uses a set of money income thresholds that vary by family size and composition to determine who is poor. Poverty thresholds do not vary geographically but they are updated annually for inflation using the Consumer Price Index (U.S. Census Bureau 2000). Low income is defined as 2 times the poverty level. The U.S. Census Bureau states the poverty level for a single person household is $9,310, and for a 2-person household is $12,490. Poverty levels are based on numbers of persons per household. For this analysis, a 2-person household level will be the basis used.

The area for consideration is Ashland and Bayfield Counties. Data was obtained from the U.S. Census Bureau website using Census 2000 data. The low-income threshold is 29% and the minority threshold is 18%. To determine the threshold levels used for environmental justice, each of these percentages is multiplied by two. Given that, low-income threshold for this analysis is 58% and 36% for minorities.

Low-Income Determination
Poverty level = $12,490 x 2 = $24,980 low-income threshold.
Number of persons with an income < $24,999 = 4,846 households or 37.5 %
Number of persons with an income > $24,999 = 8,059 households or 62.5 %
37.5% < 58% (threshold) = no further environmental justice analysis is needed.

Minority Determination

Minority (all other races that are not white were added together) = 11%, which is less than the 36% threshold. Therefore, no further environmental justice analysis is necessary.

Conclusion
Based on analysis of the census data, the actions proposed would not be identified as a potential environmental justice case. No additional study, analysis, or mitigation is needed to further comply with Executive Order 12898.

Chapter 2
ALTERNATIVES

The alternatives vary by different fire management strategies and associated areas and acres. For example, all human-caused fires would be suppressed in the entire Park under all alternatives. In alternatives B and C, which allow wildland fire use, all areas within the Park would be included with the exception of the mainland and sensitive natural resource or cultural areas. This equates to approximately 38,100 acres. Under Alternative C the Park would have the option of considering prescribed fire as a tool in these same acres for resource management objectives or to reduce unnatural buildup of fuels. Currently, natural resource management staff believes this equates to approximately 600 acres. The currently proposed acreages for wildland fire use and prescribed fire are based upon existing knowledge of fire and its effects. If knowledge and experience change or increase over time the boundaries currently proposed may be altered, or additional acreage added. Non-fire applications (mechanical treatments) would occur around sensitive cultural settings where fire risk would be considered to be too great under all alternatives, such as the light stations, fish camps, and other concentrations of combustible structures or ruins. The alternatives are summarized in the following chart, where wildland fire use and prescribed fire would entail the implementation of a professional fire management program that meets all resource objectives, safety and environmental concerns, national wildland fire policy, and National Park Service guidelines for wildland fire management, for wildland fire use (lightning-caused) and prescribed fire. Alternative C is the **preferred alternative** and would be implemented as described in the proposed Fire Management Plan for Apostle Islands National Lakeshore.

Table 2-1 Summary of approximate acres that would be included under various management actions by alternative.

	Summary of Alternatives Chart		
Alter-native	**Suppress Human Caused Fire**	**Manage Wildland Fire Use for Resource Benefits**	**Prescribed Fire**
A	42,160 Acres	0 Acres	0 Acres
B	42,160 Acres	All acres but mainland, administrative, and cultural sites. Approximately 38,100 Acres	0 Acres
C	42,160 Acres	All acres but mainland, administrative, and cultural sites. Approximately 38,100 Acres	* Potential in all acres but mainland, administrative, and cultural sites. (Approximately 38,100 Acres) * 600 acres specifically identified at present time

2.1 ALTERNATIVE A: NO ACTION

This alternative would be a continuation of the present Apostle Islands National Lakeshore wildland fire management policy. All human-caused fires would be routinely suppressed. Lightning-caused fires would also be routinely suppressed rather than managed to maintain natural processes. Fire suppression can include the mobilization of crews to create fire lines, the use of heavy equipment where approved, or the use of aircraft or helicopters to spread retardants or water.

Prescribed fire would not be used to maintain or simulate natural ecological processes or meet resource management objectives. Non-fire applications (mechanical treatment) would be used for mitigation of hazardous fuel conditions and for restoring and maintaining identified cultural landscapes. Mechanical treatment can involve the use of shears or loppers to remove vegetation, or chainsaws to de-limb or remove trees.

A variety of media would be used to sensitize visitors and local communities for the need to prevent human-caused fires.

2.2 ALTERNATIVE B: IMPLEMENT WILDLAND FIRE USE

All human-caused fires at Apostle Islands National Lakeshore would continue to be suppressed, as in Alternative A. Most lightning-caused fires in Apostle Islands National Lakeshore would be allowed to burn to accomplish specific pre-stated resource management objectives. Exceptions would include situations that threaten human life or property, violate resource management objectives, or pose unacceptable impacts to public enjoyment, or cultural or natural resources. Exceptions would also include situations that could potentially impact endangered or threatened species protected by the Endangered Species Act (1973), or air quality standards outlined in the Clean Air Act (1990). A rigorous prescription and decision-making process would be established in accordance with National Park Service guidelines to identify criteria necessary to allow a natural fire to burn. Location, size, and number of fires burning would be considered, as well as the qualifications of fire management and contingency forces required to suppress the fire if it evolved into a wildfire (moves out of prescription, threatens life or valuable resources etc.). All natural fires would be monitored frequently to maintain current information on fire size, location, rate of spread, intensity (heat generation and flame length), and potential threats which might require holding or suppression action.

The Park would be divided into the Special Use Fire Management Unit (the Mainland Area); the Natural Fire Management Unit (all Islands except Fire Exclusion Zones designed to protect infrastructure, cultural, or natural resources), and Fire Exclusion Zones. Fire Exclusion Zones are all found on the islands and are therefore within the Nature Fire Management Unit. Wildland fire use would not be implemented in the Special Use FMU; all fires would be suppressed. Fire protection would be provided for developed areas and Park boundaries in this unit. Most of the Park would be in the Natural FMU in which a variety of fire behavior could be tolerated since the risks to life and property are low and there is little chance of unwanted wildland fire escaping

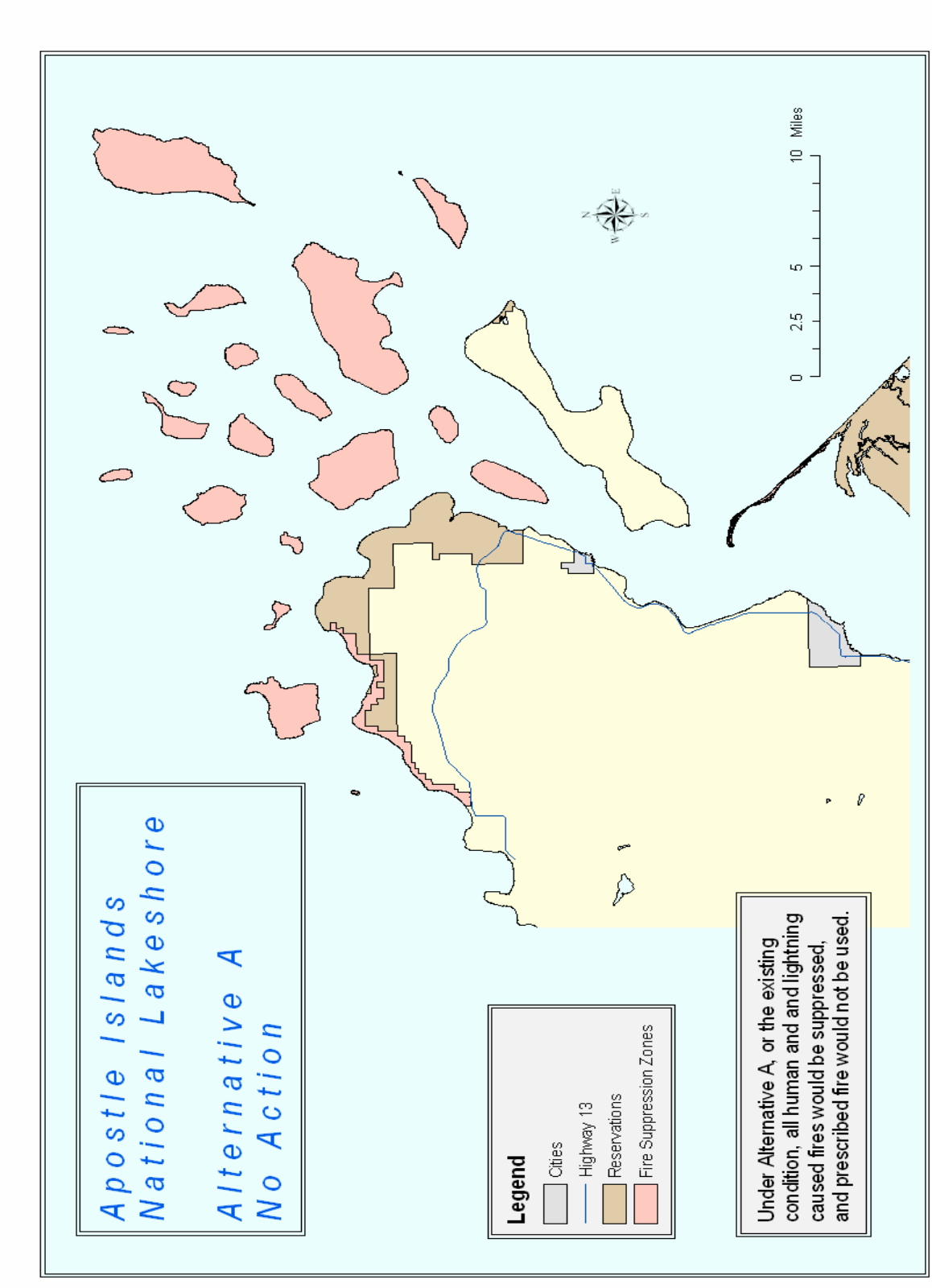

Figure 2.1-1. Alternative A

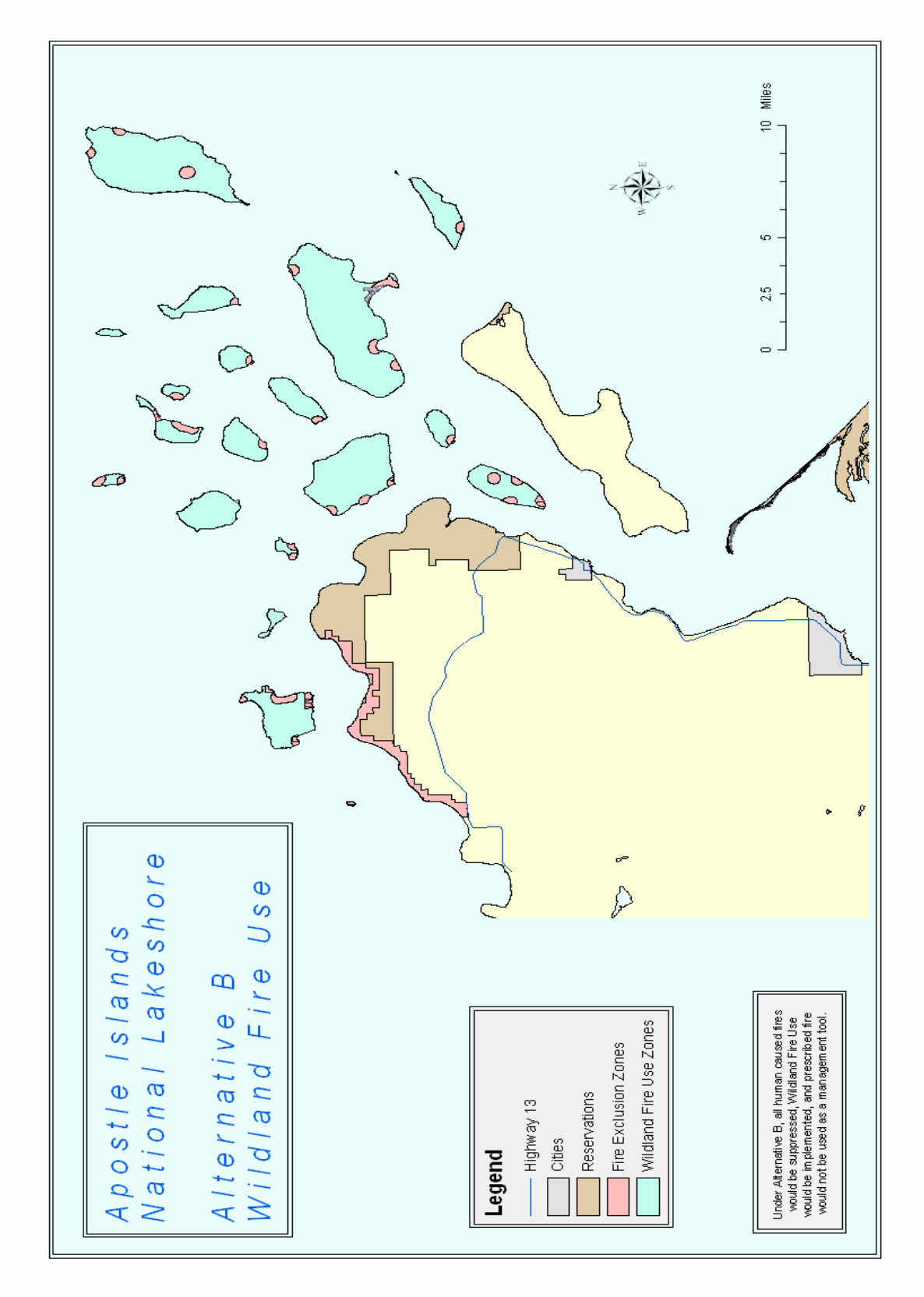

Figure 2.1-2. Alternative B

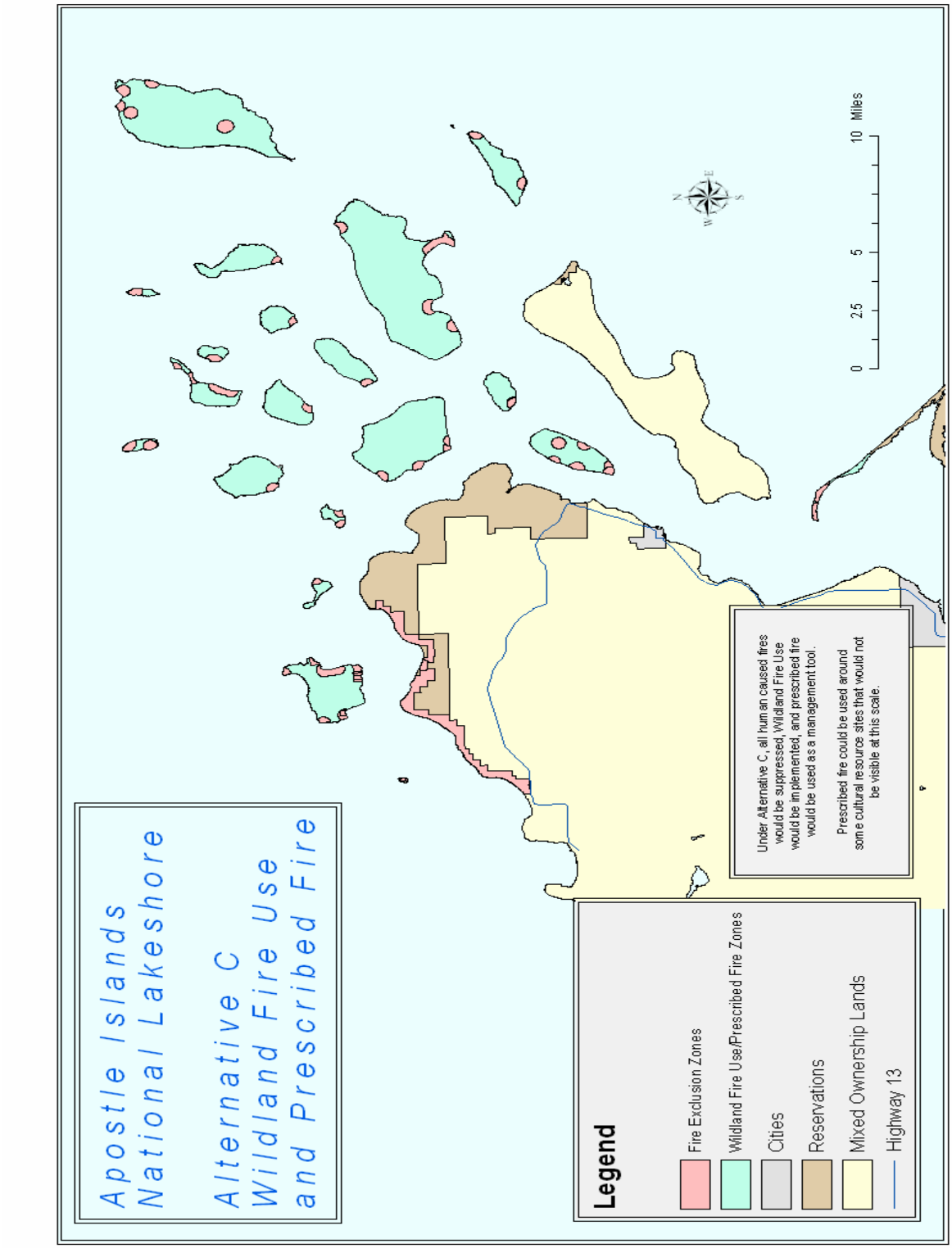

Figure 2.1-3. Alternative C

onto nonfederal lands. Fire would be excluded in Fire Exclusion Zones on the islands. The exception to this is where fire could conceivably escape to private or tribal lands. The likelihood of this is small however, due to the long, narrow shape of the island. This issue would be addressed through cooperative efforts with private land owners and the tribes. The NPS would work assertively to protect all structures and those cultural resources that would be adversely affected by fire in both Fire Management Units. The wildland fire use program would be implemented as described in Chapter V of the proposed Fire Management Plan.

Prescribed fire would not be used to maintain or simulate natural ecological processes or meet resource management objectives under this alternative. Non-fire applications (mechanical treatment) would be used for mitigation of hazardous fuel conditions and restoring and maintaining identified cultural landscapes. A variety of media would be used to sensitize visitors to the need to prevent human-caused fires.

2.3 ALTERNATIVE C: IMPLEMENT WILDLAND FIRE USE AND PRESCRIBED FIRE

Under this alternative, human-caused fires at Apostle Islands National Lakeshore would continue to be suppressed, as in Alternative A. Alternative C would implement wildland fire use and add a prescribed fire element (Chapter IV, D in the Plan). Prescribed fire would be used in the Natural Fire Management Unit as appropriate to supplement the ecological role of natural fire, protect or restore critical plant or animal habitats or communities, eliminate alien species, promote ethnographic resources, restore or maintain cultural landscapes, and/or mitigate hazardous fuel conditions near developed areas. Site-specific compliance procedures following the National Environmental Policy Act (NEPA 1986) and the National Historic Preservation Act (NHPA 1966) would be completed prior to implementation of specific prescribed fires. Cooperation with representatives from the Great Lakes Indian Fish & Wildlife Commission, and Bad River and Red Cliff Reservations would occur in the planning stages of prescribed fires. A variety of media would be used to sensitize visitors to the need to prevent human-caused fires. Non-fire applications (mechanical treatment such as cut and remove) would be used for mitigation of hazardous fuel conditions and restoring and maintaining identified cultural landscapes in areas where risk of fire damage to resources is too high. This is the National Park Service's preferred alternative because it would give maximum flexibility to the fire program. It would implement the Apostle Islands National Lakeshore Fire Management Plan as proposed.

Many of the historic sites in Apostle Islands National Lakeshore were once substantially more open than they are today, e.g., lighthouse complexes and historic farmsteads. While these areas were not necessarily created or maintained originally by fire, prescribed fires could be used to clear the encroaching vegetation and maintain the open conditions of a particular historic period. Where risk is too high from fire damage, mechanical treatment could be used to restore and maintain cultural landscapes.

Similarly, hazardous fuel conditions near cultural sites and developed areas can be reduced using mechanical treatment and/or prescribed fire, and these areas can be maintained in a low-risk condition by the periodic application of these methods.

Environmentally Preferred Alternative

The National Park Service is required to identify the environmentally preferred alternative for any of its proposed projects. That alternative is the alternative that would promote the national environmental policy expressed in NEPA (Section 101 (b)). This includes alternatives that:

1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

2) ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

3) attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;

5) achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities; and

6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In essence, the environmentally preferred alternative would be the one(s) that "causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (DOI 2001a).

In this case, the Preferred Alternative (C –Implement wildland fire use and Prescribed Fire) is the environmentally preferred alternative for the Fire Management Plan for Apostle Islands National Lakeshore since it meets the goals above better than either Alternative A or B. Under this alternative, a combination of 1) wildland fire use, 2) prescribed fires for habitat management and hazard fuel reduction, as well as 3) fire suppression, would all be used to protect human life and property, reduce hazardous fuel loadings in the Park, restore natural ecological processes, improve wildlife habitat, and reduce the risk to adjacent lands from the threat of wildfires originating inside the Park. Finally, this alternative best protects and helps preserve the historic, cultural, and natural resources in the Park for current and future generations.

2.4 Prescribed Fire Use Only Alternative considered but Not Further Analyzed

An alternative which allowed for the use of prescribed fire only was considered and rejected.

This type of alternative would not have afforded the flexibility necessary to achieve a wide variety of goals. One of the long-term, natural resource goals is to restore the natural fire regime of the Park. This would not be possible under an alternative that did not allow wildland fire use and would most easily and accurately be accomplished by implementing a wildland fire use program which establishes the frequency, and location of fires. In addition, fuel hazard in some areas is too high or too close to a cultural resource site to use prescribed fire to initially reduce fuel loadings. These types of loadings would require mechanical treatment first, followed by prescribed fire.

2.5 MITIGATIONS

Mitigations are practices which reduce or eliminate effects of management actions. All mitigations will be applied to all alternatives unless otherwise stated.

2.5.1 Air Resource

Fire managers will adhere to the U.S. Environmental Protection Agency's Best Available Control Measures.

Apostle Islands will coordinate with the U.S. Forest Service (Chequamegon National Forest) on scheduling of burns to ensure that excessive smoke impacts do not occur to the airshed.

The Park will try to minimize smoke in smoke-sensitive areas, including the following:

Madeline Island
Bayfield
Washburn
Ashland
Bad River Reservation
Red Cliff Reservation

2.5.2 Water Resources

All alternatives would follow the following special restrictions with regard to aerially applied retardant and foam use (NFES 1256, 1996):

Retardant - No retardant drops within 400 feet (120 m) of open water.

Foam (aerial delivery) - Aerial delivery of foam requires Park Superintendent approval on a case-by-case basis. When approved, the following guidelines apply:

- Foam concentrate will only be injected into the holding tank after the water pick-up operation has been completed.
- Drops from Beaver, T2 and T3 helicopters – no drops within 200 feet (60 m) of open water.
- Drops from Scoopers, heavy air tanker or heavy helicopter – no drops within 400 feet (120 m) of open water.

Foam (ground delivery with motorized pumps):

- No application within 25 feet (8 m) of open water when using small pumps.
- No application within 50 feet (15 m) of open water when using Mk III or equivalent pumps.
- All foam concentrate used for injection will be located in impermeable containment basins, e.g. visqueen (plastic sheet) spread over rocks or logs to form a catch basin.

Foam (ground delivery with backpack pumps)

- No application within 10 feet (3 m) of open water.
- All backpack pumps will be filled a minimum of 10 feet (3 m) from open water. A separate, uncontaminated container must be used to transport water from source to backpack pump. This container must be kept uncontaminated by concentrate.

2.5.3 Soil Resource

Fire suppression techniques, such as cutting fire lines down to mineral soil or using heavy equipment like bulldozers, can cause intensive disruption to the surface soil layer. Moreover, NPS policy requires the use of Minimum Impact Suppression Tactics (MIST), which further reduces the area of directly-disturbed ground surface. Tactics relevant to protecting soils include the following:

- Cold trail the fire-edge (a method of controlling a partly-extinguished fire edge) when practical.
- Wetlines or natural breaks will be used wherever possible in lieu of hand line construction if water and pumps are available. Waterbars will be constructed on hand lines on steep slopes.
- Utilize soaker hose or foggers in mop-up. Avoid "boring" and hydraulic action on shallow soils.
- Fire lines will be kept to the minimum width necessary to allow backfiring or safe black line to be created. Utilize natural barriers wherever possible to avoid a "tunnel effect."
- If a mineral soil line is needed, utilize fire line explosives whenever possible instead of a bulldozer.

2.5.4 Vegetation

- Tracked vehicles should have tires and undercarriage pressure washed before entering islands to reduce the likelihood of accidentally introducing exotic species. This is especially required of vehicles being used from other areas.

2.5.5 Threatened, Endangered, and Sensitive Species

- All known eagle, and piping plover nests, gray wolf den locations, sensitive plant locations, or habitat important to any other threatened, endangered, & sensitive species in

close proximity to prescribed fire units will be addressed during the planning phase to ensure that they are not impacted.

- To reduce noise impacts from over flights or other equipment on sensitive species such as the currently threatened bald eagle, the Fire Management Officer will work with Park Natural Resource staff to determine unit-specific mitigation measures in the operational plans for the fire activity. Active bald eagle nests will be avoided entirely if possible. If it is determined that using aircraft in the vicinity of nesting bald eagles is necessary, takeoffs and landings will be avoided within 1/4 mile (0.4 km) of the nest. Under no circumstances shall aircraft be within 500 feet (150 m) of a nest. Recurring activity (passes, circling, hovering) will remain 1,500 feet (450 m) or more above ground level. Noise impacts will be evaluated as Park managers determine the "Appropriate Management Response" for a fire. In addition, no human foot traffic should occur within 500 feet of an active nest.
- In the event that the gray wolf is documented in the Lakeshore in the future, no fuel management activities will take place within ½ mile of a wolf den or rendezvous site from March 1 to July 31.
- Any fire that is judged a threat to any active sensitive, threatened, or endangered species den or nest would be suppressed.
- Any potential threats to critical habitat for piping plover on Long island or other designated critical habitat for other species will be considered. No fuel management activities are proposed to take place within piping plover habitat, including the areas designated as critical habitat.
- Any chemicals proposed for use in fire control or suppression activities should be evaluated for potential harm to listed species and used in a manner that would mitigate that harm (e.g., application away from wetlands or water bodies).

2.5.6 Wildlife

- Fire management staff will coordinate with Natural Resource management staff to develop prescribed fire plans with sufficient lead time to complete any surveys necessary prior to implantation of any fires.
- Fire management staff will inform the Chief, Protection and Resource Management of wildfire suppression activities as soon as possible.

2.5.7 Wilderness

- Stumps will be flush cut, and covered with duff.
- Any cutting of limbs should be done in a manner to reduce visibility from trails or other Visitor Use Areas.
- The use of power tools may be necessary and should be done so in a manner that minimizes the associated noise.

2.5.8 Soundscapes

- Fuel treatments near the campgrounds and developed areas would be restricted to times of low visitor use of the Park to minimize and/or eliminate noise impacts on recreationists and visitors.

2.5.9 Cultural Resources and Fire Control Tactics

The single most important mitigating action to minimize the risk posed to cultural resources by fire will be an assertive, advance fuel-reduction program. Currently, even the well-known lighthouse complexes are adversely impacted by vegetative encroachment, while many lesser-known backcountry sites are on the verge of complete obliteration. Many of the Park's cultural resources are highly vulnerable to fire; these include the 158 structures enumerated on the List of Classified structures, but also ruined buildings at logging camps and farmsteads, orchards, and museum objects housed at field locations (see Appendix E).

Fuel reduction would entail periodic clearing of vegetation around designated sites. This would not only reduce the risk of fire spread, but would also lessen hazards to the resources as well. It should be noted that the unique "Herring King" cottage on Sand Island, made from the remains of a wrecked fishing boat, was crushed by a falling tree in the late 1990s, and the structures of Outer Island's Lullabye Logging Camp, still standing as recently as the early 1990s, have now all but collapsed.

The radius of clearing would be dependent on the density and composition of the surrounding forest, as well as the vulnerability of the specific site. The jack pine (*pinus banksiana*) forest encroaching upon the LaPointe Light Station buildings would call for assertive treatment, for example, as would the complex of wooden cabins, filled with irreplaceable museum artifacts, at the Manitou Fish Camp.

Fire management activities that disturb the ground in any way (i.e. fire line construction using hand tools) would use paraprofessional and professional archeologists working in cooperation with firefighters and pre-burn preparation crews to prevent impacts to cultural resources. During a wildfire the highest priorities are safety and controlling the blaze. If fire lines cannot be diverted, unavoidable impacts to cultural resources may occur. In most cases, however, damage can be averted. The following measures would be undertaken to help mitigate impacts on cultural resources under all three of the alternatives during fire suppression, prescribed fire, mechanical treatment, and during rehabilitation activities:

- Fire management staff will coordinate with the Park Cultural Resource Specialist during the development of prescribed fire plans in order to determine if archeological investigation is necessary, and consult with Native American tribes.
- Fire management staff will inform Park Cultural Resource Specialist of wildfires and suppression activities as soon as possible.
- Park Cultural Resource Specialist will coordinate with fire management staff regarding known cultural resources in prescribed fire units and recommend protective measures. All

cultural resources located in or near prescribed fire units will be protected to the extent possible.

- The Cultural Resource Specialist will inform and consult with the State Historical Preservation Officer (SHPO) and Native American tribes, and if necessary, the Advisory Council on Historic Preservation, on forthcoming projects and activities, such as prescribed fires for hazard fuel reduction in the vicinity of historic properties, to ensure compliance with Section 106 of the National Historic Preservation Act (NHPA 1966). In addition, contact will be made if cultural resources are threatened or destroyed during wildland fires.

Chapter 3
AFFECTED ENVIRONMENT

3.1 NATURAL RESOURCES

Apostle Islands National Lakeshore (NL) is located along Northern Wisconsin's Lake Superior coast on and adjacent to the Bayfield Peninsula. It is within Bayfield and Ashland Counties. The Park is approximately 42,160 acres (17,094 hectares) of land area and includes 21 islands, ranging in size from 3 to 10,000 acres (1.22 to 4070 hectares) and a 12 mile (22.24 kilometer) segment along the mainland shore consisting of 2,565 acres (1043 hectares). Oak Island has the highest point in the Park at 1,081 feet (3,546 meters) above sea level or 479 feet (1,571 meters) above the level of Lake Superior. There is no opportunity for fire to spread beyond Park boundaries except on the Mainland Unit and on Long Island which has a narrow attachment (< 0.1 mile or 146 meters) to the mainland.

The local climate and therefore fire weather is moderated by the "maritime" situation of the islands; compared with the adjacent Bayfield Peninsula, winters are warmer, spring arrives later, summers are cooler, and fall lasts longer. The far northern islands, Devils, and Outer, have noticeably cooler climates than ones farther south. Prevailing storm winds blow from the northwest, north, and northeast, and winter storms from these quadrants are significant factors in determining island vegetation, especially in the northwestern and northern parts of the archipelago.

3.1.1 Air Quality

Apostle Islands National Lakeshore is a Class II Air Quality Area under the Clean Air Act (42 U.S.C. 7401-7671q (as amended in 1990)). Due to the lack of industrialized centers or intensive agriculture in the area, air quality of the Park is generally outstanding. However, pollutants from the coal and wood-fired power plant in Ashland, Wisconsin, located approximately 12 miles south of Long Island, and the Duluth-Superior industrial Park, located approximately 70 miles west of Sand Island, may reach the area under certain wind conditions. In addition, long-range transport of airborne contaminants continues to bring pollutants, such as polychlorinated biphenyls (PCBs), dichlorodiphenyldicloroethene (DDE), lead, mercury, and toxaphene into the Lake Superior Basin. Smoke from wildland fires occasionally drifts into the area from Canada and the western United States, creating hazy conditions and a detectable smoky smell.

3.1.2 Water Quality

Lake Superior is the coldest and cleanest of the Great Lakes. The overland drainage area is small compared to its immense size and the watershed has a high percentage of forest cover which contributes to the high water quality. Point source pollution occurs primarily from municipalities and Canadian pulp mills around the lake, but they are widely scattered and strong circulation

disperses pollutants widely. Airborne contamination is the major source of the most persistent pollutants (Apostle Islands NL Resource Management Plan 1989). Lake concentrations are minute; however, biological accumulation in aquatic organisms of these contaminants continues to be a concern. Lake Superior has an extremely slow flushing time for toxins. It takes approximately 200 years for the lake to clear 95% of non-degrading, non-settling pollutants. Only 0.05% annually can be expected to leave by way of St. Mary's river, the only outlet for the lake. Fortunately, concentration levels have been decreasing since the use and manufacturing ban of many of these compounds.

Water quality is temporarily degraded locally by strong weather events. Heavy rain and spring runoff may discolor near shore lake waters, and wave erosion generated from high winds can cause a significant increase in particulate matter in the waters around islands with clay/sand banks.

Generally, larger islands have small intermittent streams. Stockton and Outer Islands have more extensive stream systems some of which are impounded by beaver dams. Stockton, Outer, and Michigan Islands have lagoons associated with sandspits. Small wetlands are also present behind or in close proximity of sandspits on Bear, Raspberry, and Rocky Islands. Long Island is actually a barrier spit connected to the mainland. It has several types of wetlands including ridge and swale topography in its northwest end, sphagnum/heath wetland behind the Chequamegon Bayside beach running along most of its length, and extensive sedge meadow habitat on its southeast end. Sphagnum bogs and wetlands associated with poorly drained lowlands are present on several Islands, e.g., Bear, Devils, Sand, South Twin, and Stockton.

3.1.3 Geology and Soils

The area is in the southwestern portion of the Canadian Shield, a group of ancient lavas that underlie most of northeastern North America. By about 1.2 billion years ago, the present Lake Superior basin had formed as a rift that gradually accumulated lavas. Some of this rock eroded away and was deposited as sand by streams. This sand was lithified into the sandstone that forms the base of nearly all the Apostle Islands. The rock forms outcrops that are seen as shelves and wave-eroded cliffs on the shores of the islands and on the northern shore of the Bayfield Peninsula. Advancing and melting Pleistocene glaciers (3 million to 10,000 years ago) formed and shaped the islands. Glacial till (material of various sizes dropped directly by melting ice) is particularly characteristic of the high reddish cliffs on the western sides of most of the islands. Old beach lines from changing glacial lake levels can be seen on Oak, Outer, Rocky, and South Twin Islands. Weathering from precipitation, frost, wind, sun, and wave action continue to erode and sculpt the Park. Caves resulting from these processes are present on the Mainland Unit, and Devil's and Sand Islands.

Park lands range in elevation from 602 feet above sea level to 1,081 feet. Seventy percent of the Park falls into a "B" slope class (NRCS GIS soils data 2003), which is a 0 to 6 percent slope, and 12% falls into the "C" slope class (6-15%;). The remaining 18% falls into the A, D, E, and F slope classes at less than 10% each. The ravines of the Park, found primarily on Oak Island and to some extent the Mainland, account for the acres in the E and F slope class (slopes greater than 30 percent).

Unique land features include rocky cliff faces, clay banks, sandscapes, and bogs. Cliff faces are marked by thin or no soil. Bluffs of glacial till (also known as clay banks) contain a high percentage of sand which is eroded rapidly and transported by long shore currents to form a variety of coastal sand features. These include cuspate forelands (Raspberry, and South Twin), and sandspits. True sandspits are found on several islands including Cat and Outer. Long Island is a barrier spit with a narrow connection (< 0.1 mile or 146 meters) to the mainland. Rocky and York Islands support well developed tombolos. Stockton Island has one of the few examples of a double tombolo in the Great Lakes (Judziewicz and Koch 1993). Presque Isle Point was separate from Stockton Island until approximately 5,500 years ago when two sand spits lengthened to the point where they met Presque Island and enclosed a lagoon. Approximately 2,500 to 3,200 years ago, a barrier beach formed on the eastern side of the peninsula and enclosed the Julian Bay lagoon.

There are several soil types on the islands including clays, loams, and sands, and various combinations of these types. Thirteen percent of the soils in the Park are considered to be shallow to bedrock. This can negatively affect rooting depth and stability of tree species. Soil texture can also affect vegetation structure and function. Clay is present as subsoil under both loam and sand in the two most abundant classes (Table 3.1.4.1.). Soils are separated into texture classifications based upon particle size going from the largest sand granules, down through loam, silt, and finally to the smallest particles found in the clay type. Soil texture has an affect on the vegetative community type present just by how rapidly water moves through the soil. Water will drain quickly through large grain, course, sandy soils but has the potential to pond on clay soils. Subsequently, sandy soils support vegetation more adapted to drier conditions including oak and pine savannas and forests, whereas finer textured soils tend to support species associated with moister conditions such as northern hardwoods, or cedar, or spruce forests. Some soil types such as those with sand over clay promote tip-up of trees because water moves quickly through the sand but ponds on top of the more impermeable clay layer. Twenty percent of the soils on the islands are sand over clay. Table 3.1.4.2 shows the percent acres of soil moisture status classes and indicates that fully half of the Park falls into a moist over wet class. Another 17% of the Apostle Islands falls into the moist over dry class, and the third largest category is the moist class at 13 percent.

Table 3.1.3-1. The percent of Apostle Islands National Lakeshore lands found in various soil texture classes (NRCS data 2003).

Soil Texture Classes	Percent of Park (acres)
Loam over Clay	21
Sand over Clay	20
Sand	18
Sandy Loam	16
Silt Loam	9
Sand over Loam over Clay (Udorthents)	7
Loam	4
Mucky Peat over Loam over Muck over Sand	3
Loam over Sandy Loam	1
Muck over Loam over Mucky Peat	1
Silt Clay Loam	<1%
Muck over Sand	<1%

Table 3.1.3-2. The percent of Apostle Islands National Lakeshore lands found in various soil moisture status classes (NRCS data 2001). Four percent open water area not included.

Soil Moisture Status Class	Percent of the Park (Acres)
Moist over Wet	50
Moist over Dry	17
Moist	13
Moist-Wet over Wet-Moist	7
Udorthents (found in ravines)	7
Beach	1
Wet/Moist	1

3.1.4 Floodplains and Wetlands

Executive Order (EO) 11988 on Floodplain Management requires all Federal agencies to take action to reduce the risk of flood loss, to restore and preserve the natural and beneficial values served by floodplains, and to minimize the impact of floods on human safety, health, and welfare. Because many wetlands are located in floodplains, Executive Order 11988 has the secondary effect of protecting wetlands.

Executive Order 11990, Protection of Wetlands, states an overall wetlands policy for all agencies managing Federal lands, sponsoring Federal projects, or providing Federal funds to State or local projects. It requires Federal agencies to follow avoidance/mitigation/ preservation procedures with public input before proposing new construction projects.

In 1998, the National Park Service issued Director's Order (DO) #77-1, establishing policies, requirements, and standards for implementing EO 11990 (NPS, 1998b) along with a procedural manual for wetland protection (NPS, 1998c). Directors Order #77-1 identifies the goal of "no net loss" of wetlands on national Parks and commits NPS to a longer-term goal of achieving a "net gain" of wetlands in the national Park system by means of restoring degraded wetlands. The procedural manual identified a number of functions and values associated with wetlands:

- Biotic Functions (e.g., fish and wildlife habitat, floral and faunal productivity, native species and habitat diversity, threatened and endangered species)
- Hydrologic Functions (e.g., flood attenuation, stream flow maintenance, ground water recharge and discharge, water supply, erosion and sediment control, water purification, detritus export to downstream systems)
- Cultural Values (e.g., aesthetics, education, historical values, archeological values, recreation, interpretation)
- Research/Scientific Values (e.g., "reference sites" for research on un-impacted ecosystems).

The largest drainage on the mainland unit is Sand River which empties into Sand Bay of Lake Superior. Saxine Creek is located at the extreme south end of the mainland unit and several smaller, unnamed drainages are found throughout. The development of surface-drainage varies by island and is based upon topography, island size, and relief. Variation in elevation is not a significant feature of Apostle Islands. The smaller islands including Devils, Eagle, Ironwood, Gull, North Twin, and South Twin lack any significant drainage channels that are identifiable on 10-foot interval topographic-contour maps. Streams are present on all other islands but most notably on Oak, which has the greatest topographical relief (approximately 400 feet), Outer, and on Stockton, which has the largest single drainage basin (2.56 square miles).

Wetland types in the Park include alder thickets, beaver flowages, bogs, lagoons, marshes, ridge/swale communities, and wet sedge meadows. These wetlands contain unique flora and fauna species and add a considerable amount of ecological diversity to the Park. Wetlands dominated by thickets of speckled alder are frequent on the Apostle Islands and are found in association with a number of habitats. These very wet communities frequently fringe beaver flowages, sandscape bogs, and old roads (Judziewicz and Koch 1993). Beaver flowages on Outer Island add "islands" of bird diversity and are one of the most varied habitats in the Park for breeding birds. Bogs dominated by sedges, ericads, and Sphagnum mosses often occur in the filled-in lake basins that occur just inland from sandscape dune ridges. The larger bogs on Michigan, Outer, and Stockton Islands have lagoons with floating and submersed aquatic species. Bogs are also found on the poorly-drained summit plateaus of many of the islands, especially on Bear, Devils, and Otter Islands, but also on Sand Island. These interior wetlands are often smaller and have poorer bog floras than their coastal, sandscape counterparts, but all of the common ericads and insectivores are usually present (Judziewicz and Koch 1993). Lagoons occur on Michigan, Outer, and Stockton Islands and also the mainland unit. The Julian Bay lagoon on Stockton Island has a very rich flora, including rare species such as coast sedge, Michaux's sedge, sooty beak rush, dragon mouth and yellow-eyed grass. Long Island, a barrier spit, is a series of ridges and swales with numerous wetlands in the swales (Resource Management Plan 1999).

3.1.5 Vegetation

The Park is at the continental northwestern limits of the hemlock-white pine-northern hardwood forest and also contains elements of the boreal forest. About 90 percent of the Apostle Islands were dominated by Mesic (moderate amount of moisture) upland mixed coniferous/hardwood forest during presettlement times. Primary species included hemlock, white pine, sugar maple, yellow birch and white birch (Judziewicz and Koch 1993). On better drained soils, Dry Mesic forest with red oak was present. In more poorly drained soils Wet Mesic forests with balsam fir and white cedar were found. Canada yew was abundant in the presettlement understory. One of the goals of the Park is to restore the vegetative communities to what would have existed in the absence of land use practices that have occurred in the past.

Various land use practices, especially logging, have changed the forest composition over time. In the late 1800's white pine was harvested, followed by the removal of large hemlocks, yellow birch, and sugar maple until nearly all virgin stands were harvested by 1950. A wide range of species were harvested from a number of islands until the 1970's. Severe slash fires often occurred after harvesting and several islands were affected. Harvesting and fires were followed by regeneration of early successional species. This regeneration attracted deer to the islands and a severe irruption occurred in the mid- to late 1940's. Canada yew was practically extirpated from several of the islands.

Yew is still dominant on, Devils, Eagle, North Twin, Outer, Raspberry, Sand, and York, Islands which didn't have a history of deer irruptions. Islands that had a moderate deer population but still retained dominant yew include Cat, Ironwood, Michigan, and Otter. Yew declines significantly as a result of deer herbivory but also declines frequently after fire. This is evident on southern half of Outer Island which did not have herbivory but was logged and burned. This half has a lower abundance of yew than the northern half. The northern portion was logged but not burned.

The major ecological communities present today were derived by applying the Wisconsin natural community types to Park vegetation. Table 3.1.6.1 describes the physiography, soils, and vegetative species associated with each type. The Parks only representation of the rare Great Lakes Barrens community type in the Park is on the Stockton Island tombolo. This community type is very dry and associated with one of the Great Lakes. White pine is well represented in the Dry Mesic/Mesic forest type. There has been a 6% decrease in this species since presettlement as a result of logging. Today white pine is limited to sandscapes as mature second growth stands and as scattered super-canopy individuals on Outer and Sand and the unlogged Devils and North Twin Islands.

The Mesic forest community type includes the hemlock/white pine/hardwood, and boreal forests. Hemlock is no longer a dominant tree in the archipelago except in stands on Bear, Oak, Outer, and Stockton Islands. A comparison of presettlement and present day community types shows hemlock has decreased from 26 to 4 percent. Decline of hemlock and white pine has benefited aspen and white birch, and sugar maple the most. Aspen species and white birch (18% increase between presettlement and current forests) also increased dramatically in the first decades after logging ceased but are now mature and starting to decline. Sugar maple is doing well on well-

drained upland second-growth sites and is the only one exhibiting good seedling and sapling recruitment. Boreal forest is an important upland community in the archipelago. Elements of the boreal forest exist on North Twin, Raspberry, Rocky, Sand, South Twin, and York Islands but the northern two-thirds of Devils Island has what Judziewicz calls "classic boreal forest" where white spruce, balsam fir, white cedar, white birch, and aspen dominate (Judziewicz and Koch 1993).

There are approximately 1,300 acres of old growth forests on several islands in the Park including Devils, North Twin, Outer, Raspberry, and Sand. These forests are either Dry Mesic or Mesic forests. A 200 acre old growth hemlock stand on the north end of Outer Island is believed to be 385 years old. As such, it is one of the oldest old growth hemlock stands in the Great Lakes region. Dry mesic old growth forests on Sand Island support extremely large white pine trees.

Wet Mesic forests are comprised of white cedar, balsam fir, and black ash. One type of Wet Mesic forest is the Krumholtz forest, or those stunted by the harsh conditions such as shallow soils and exposure to maritime weather. Krumholtz forests are found on the northern tips of Bear, Cat, Devil's, and North Twin islands, and Austad Point on Outer Island. They occur along coastal bluff-tops and extend inland between 10-30 meters on Devil's Island which has the best example of this type. The forests are low and include white birch, balsam-fir, white cedar, and impenetrable Canada yew.

Other ecological communities include clayscapes, rockscapes, and sandscapes (Judziewicz and Koch 1993). Clayscapes are clay bluffs that occur on most of the islands. Erosion is common in these dynamic communities. Rockscapes include pre-Cambrian sandstone ledges and bluffs. Willows, alders, balsam-poplar, red-osier dogwood, and showy mountain-ash are frequently found on the low, wave-splashed shelves. Some herb species include Canada goldenrod, fireweed, fleabane, grasses, horseweed, violets, wild strawberry, willow-herbs, and yarrow. Some ledges may be calcareous (calcium rich) which is reflected by the plants that dwell in these habitats including bird's-eye primrose, harebell, brook lobelia, grass-leaved goldenrod, ninebark, meadowsweet, wood strawberry, and three-toothed cinquefoil. Shaded bluffs may house spikenard, long beech fern, oak fern, and fragile ferns. Sandscapes include several unique landforms such as barrier beaches (Julian Bay on Stockton Island) and spits (Long Island), cuspate forelands (Raspberry and South Twin Islands), tombolos, a double tombolo (Stockton), and sand spits (Cat and Outer Islands). The various landforms originated in different ways and all of them are on the southern tips of the islands. Sandscapes are typically comprised of a beach that is devoid of vegetation, active dunes, interdunal hollows, stabilized dunes and/or beach ridges, and frequently a former lake basin covered with bog or alder thicket community type vegetation.

Community Type	Physiography	Soils	Vegetation			Percent of Park
			Trees	Shrubs	Herbs	
Great Lakes Barrens	Great Lakes shorelines	Sand	Red pine, white pine	Common juniper, huckleberry, blueberry, bearberry, wintergreen.	Bracken fern, bunchberry, pink lady's slipper	Stockton Island tombolo <1%
Dry Mesic Forest	Glacial outwash or lake plains; thin glacial drift over bedrock; or course-textured end-moraines.	Sand, loamy sand.	Red pine, red oak, red maple, white pine, aspen, birch, jack pine.	Hazelnuts, blueberries, wintergreen, partridge-berry.	Wild sarsaparilla, Canada mayflower, and cow-wheat.	5%
Mesic Forest	Course-textured ground and end moraines; sandy lake plains, silty/clayey lake plains, and thin glacial till over bedrock.	Loamy sand to sandy loam. Widely ranging acidity.	Sugar maple, hemlock, white pine, yellow birch, basswood, white ash.	Canada yew, beaked hazelnut, skunk current, June berries, fly honeysuckle.	Wood ferns, corn lily, bluebead lily, starflower, wild sarsaparilla, Canada mayflower, violets, and club mosses.	72%
Wet Mesic Forest	Along moving water sources such as lakes, streams, & drainage ways. Sometimes on glacial outwash & lake plains.	Peat Very strongly acidic, or neutral to mildly alkaline.	Cedar, balsam fir, spruces, tamarack, black, ash, paper birch, yellow birch, red maple.	Twinflower, creeping snowberry.	Rich in sedges, orchids & wildflowers i.e. goldthread, fringed polygala, & naked miterwort. Rich in sphagnum species.Numerous rare species.	17%
Wet Forest	Glacial outwash or lake plains, & in kettles in course textured moraines.	Peat Extremely acidic to very strongly acidic.	Black spruce, tamarack, balsam fir.Jack pine can also occur.	Leatherleaf, Labrador tea, small cranberry.	Sedges, sphagnum species, and feather mosses.	<1%
Northern Shrub Thicket	Near streams, rivers, & lakes in glacial outwash, ice contact topography, or course-textured end moraines.	Muck	None	Speckled alder, skunk currant, swamp red currant.	Spotted touch-me-not, swamp cinquefoil, yellow & tufted loosestrifes, bugleweed, skullcaps &others	<1%
Bogs	Lake or pond margins, in depressions in glacial outwash and sandy glacial lake plains.	Saturated peat Extremely acidic	Tamarack	Leatherleaf, Labrador tea, small cranberry .	Sedges, sphagnum species, pitcher plants, and sundews.	<1%

Table 3.1.5-1. Major ecological community types found at Apostle Islands National Lakeshore. Other types described in the text include **Clayscapes, Rockscapes, and Sandscapes**

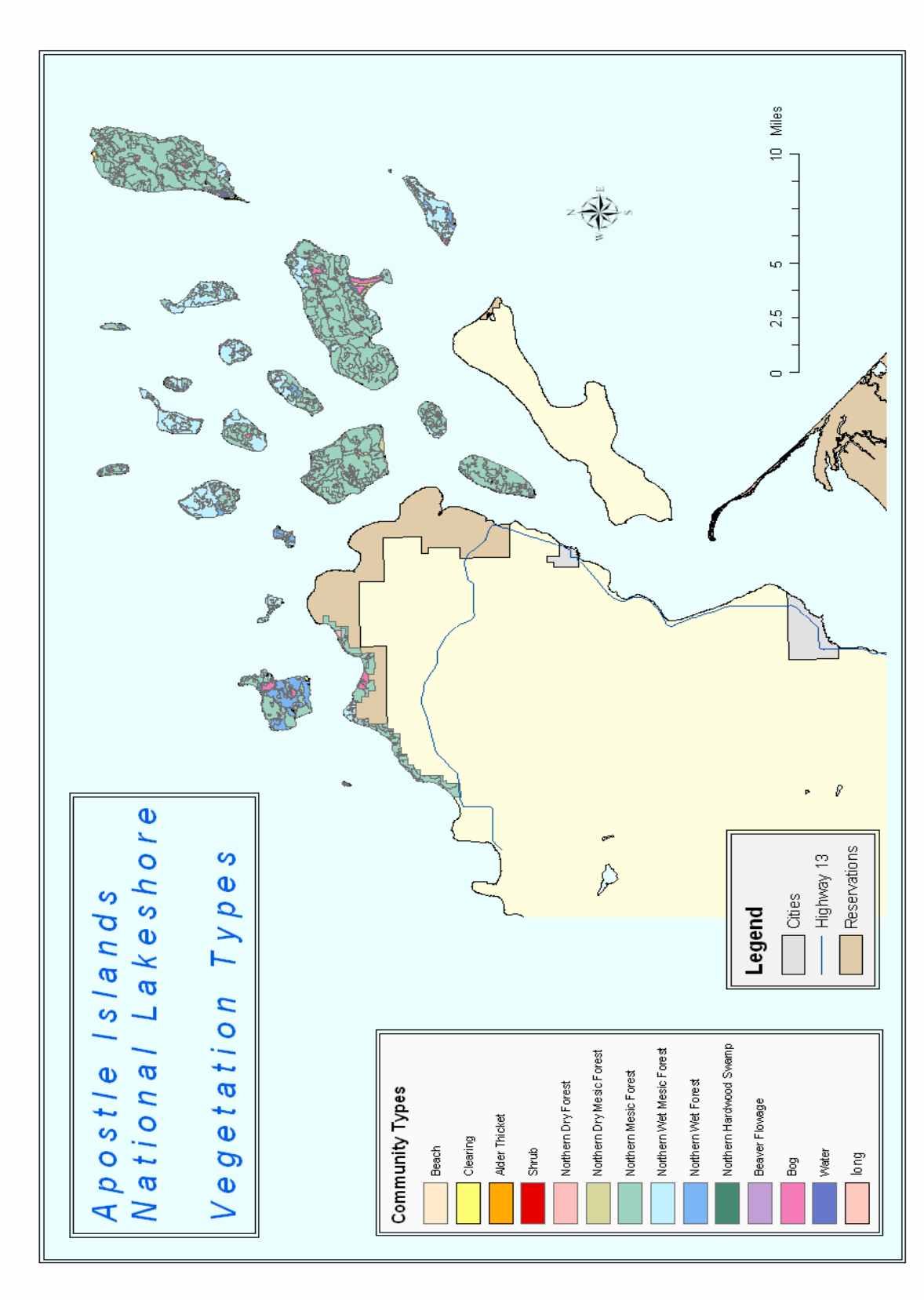

Figure 3.1.5-1. Vegetation Types

3.1.6 Natural Processes

Natural processes include ecological disturbances such as storms and wildland fires. Both disturbance types can occur at different sizes or scales, and smaller events occur much more often than large catastrophic ones. This is because more extreme conditions such as a 100 year drought or infrequent, excessive winds are required to create catastrophic events. Disturbance processes are complex with interrelated causal factors, complicated patterns of movement across the landscape, and interactions of physical and biological features with the disturbance process. Subsequently, every community type has a predominant disturbance type, and a frequency or regime for all disturbance types.

The main source of natural disturbances is the overall climate of a region and the local weather. Collectively these control long-term moisture conditions and more immediate storm conditions which frequently interact to shape the effects of a disturbance. For example, long-term drought conditions promote the likelihood of fires igniting and being able to spread quickly. The 21 Apostle Islands of the Park are situated in Lake Superior which imposes a maritime influence on the local conditions. The lake absorbs and releases heat more slowly than land which causes a slower change in temperatures. Subsequently, the winters are warmer on the islands as compared to the Bayfield Peninsula. Spring also arrives later, summers are cooler, and fall is longer. The far northern islands, Devils and Outer Islands, have climates that are noticeably cooler than more southerly islands (Judzeiwicz 1983). Mean maximum daily temperatures are 24 degrees Fahrenheit in January and the mean minimum is 7 degrees. Mean maximum in July is 78 and the mean minimum is 54 degrees. The highest temperature recorded is 100 degrees while the lowest is -31 degrees. The growing season is 120 days.

The islands vary in size from 3-10,000 acres and it is likely that they experience higher relative humidity than comparable communities on the mainland. It is also likely that the relative humidity on the smaller islands changes more quickly than that of the larger islands. Precipitation averages 29 inches annually with about 78 inches of snow.

Winds are variable, potentially strong, and impact a great deal of area, especially along the exposed perimeters of the islands. Winds are predominantly from the northwest in the winter months and less frequently from the northeast, west, and southwest (U.S. Geological Survey 1963). Winter storms from these quadrants are strong factors in determining island vegetation especially in the northwestern and northern parts of the archipelago (Judzeiwicz and Koch 1993). Historical data from the National Oceanic and Atmospheric Administration (NOAA) Devils Island weather buoy (DISW3 at www.ndbc.noaa.gov) indicate that between 1983 and 2001 average wind speeds were between 3-26 mph with a range of 0-69 miles per hour. Gusts above 46 mph occurred in all months during this time peak gusts of 69 and 76 mph have been reported in March.

How a disturbance moves across a landscape and the effects of the disturbance can be influenced by the physiography and landforms associated with an area. For example, fires readily and quickly move up hilly landforms but can stop or slow significantly upon reaching the top. A windstorm moving west to east across a level landscape that is imbedded with small inland lakes will likely impact the exposed forests on the east side of the lakes. Similarly, a windstorm

moving across a hilly landscape will likely impact the most exposed communities on the slope facing the direction of the wind. The 21 Apostle Islands are spread out across a 280,000 acre area with 140 miles of shoreline that is exposed to Lake Superior. A single, large windstorm could impact more than one island at a time, especially along these exposed areas. In addition, larger portions of the smaller islands are more readily exposed to the effects of wind. However, the likelihood that lightning would strike one of the islands is limited due to the nature of the archipelago which has vast areas of water between the islands. In addition, it is extremely unlikely that a fire would move from one island to another. Subsequently, size of fire disturbance would immediately be restricted by the size of the island in question.

Physical and biological features such as soils, water table, and vegetation also interact with disturbance processes to complicate effects on the landscape. Shallow soils provide less space for trees to root which contributes to tip-up or blowdown. Thirteen percent of the soils in the Apostle Islands are shallow to bedrock (NRCS 2003). A second soil condition that promotes tip-up is sand over clay. This condition promotes tip-up because water moves through the sand but ponds on top of the clay, forming a perched water layer that offers little stability. An additional twenty percent of the soils are this type in the Park. Finally, communities with very moist or wet soils can also be susceptible to wind because trees can not anchor as well in these conditions either.

The type of vegetative community present also affects how a disturbance moves across a landscape. For example, some tree species such as jack pine are very flammable which can result in a fire moving through this community type rather than an equally accessible, but much less flammable community type. Indeed, fires moving across a dry landscape can slow significantly or stop when encountering moist communities such as an aspen forest. Interaction also occurs between vegetation and wind. Some species such as northern white cedar often have intertwining roots and frequently whole groups of cedar trees blow over during windstorms rather than individuals.

Damage causing winds or storms occur at different, but interrelated intensities and frequencies. Generally, small, less intense disturbances occur more often than larger, more intense storms. Typical combinations include frequent but low intensity windstorms that occur every 10-20 years and create canopy gaps equivalent to the size occupied by 1-3 canopy trees (Frelich 1998). These types of storms fall into the F-1 category on the Fujita wind scale with winds between 73 and 112 mph (Fujita 1981). More intense storms typically occur at 300-year intervals but impact 30-40% of trees in the canopy, and extreme storms can occur every 1,000 to 1,500 years and impact an entire forest (Canham and Loucks 1984).

Historical wind disturbances have been found to be small in size across northern Wisconsin, averaging between 230 and 840 acres and these smaller patches were found to be more abundant than larger patches (Schulte and Mladenoff 2001). Large wind events occurred in a wide variety of community types including aspen, oak, northern hardwoods, hemlock, white pine, spruce, tamarack, and white cedar. The average size of wind events is similar between historical and current times.

Susceptibility of a tree or group of trees to wind is dependent upon tree species, size, type of anchorage, and the degree that the trunk is rotted. Larger trees and old growth forests are more susceptible to blowdown than are young trees and even-aged forest. Approximately 5-7% of canopy trees in older forests were affected every decade in the Upper Great Lakes region (Frelich and Lorimer 1991a). As was mentioned previously, shallow rooted trees are more susceptible than are deeply rooted trees. Winds between 40-72 mph can push over shallow rooted trees (Fujita 1981).

Light and intermediate levels of windthrow historically had a greater cumulative effect in structuring northern hardwoods-hemlock stands than heavy windthrow in the northern Great Lakes states (Schulte and Mladenoff 2002). The historical rotation period for heavy windstorms was found to be longer than the maximum age of shade tolerant species leading some to suggest that wind prone landscapes were historically dominated by multi-aged forests, often in late successional stages (Frelich and Lorimer 1991b). Seedlings typically survived windstorms and regenerated the previous forest. Subsequently, succession to different forest types as a result of wind related disturbances was limited. Historical hemlock-hardwood forests in the Upper Great Lakes region were described as 80-90% old growth with the remainder recovering from canopy-killing disturbance (Frelich and Lorimer 1991a). These types of forests could exist in this old multi-aged state for many centuries. The composition of a forest underwent a major change only when an extreme windstorm resulted in large amounts of slash that subsequently burned. In these situations understory trees and the seed bank in the soil were destroyed and paper birch was a main invader (Frelich and Reich 1995b).

Types of fire regimes and fire return intervals (Dickmann and Cleland 2002) are presented in Table 3.1.6-1 for forest types that occur in the Park. Fire regimes are classified as Savanna Maintenance (SM), Forest Maintenance (FM), or Forest Replacement (FR). The maintenance categories are those in which fire promotes the continuation of the community type whereas the replacement category indicates that fire will function to replace one community with a different one. Fire return intervals are the time between two successive natural fires in a given area and they are presented for the various community types present in the Islands. Red pine, white pine, balsam fir, and black spruce all have both Forest Maintenance and Replacement regimes. This is because these species are either somewhat adapted to fire or can readily regenerate after fire. The majority of the Mesic Forest communities present during presettlement times and the Wet Mesic type fall into the Forest Replacement (FR) fire disturbance regime. In addition, the majority of these types of forests have a very long fire return interval.

Table 3.1.6-1. Presettlement and current vegetation schemes by community and species type. The percent of the Park, type of fire disturbance regime, and fire return interval are also displayed.

Vegetation Type/Species[1]	Percent Presettlement[2]	Percent Current[3]	Disturbance Regime and Fire Return Interval (years)[4]
Dry Mesic Forest	**5**	**5**	
Red oak	<1	3	SM (5-15) FR2 & 3 (75-350)
Quaking aspen	1	2	FR1 (30-75)
Red pine	4	< 1	FM1&2 (5-100) FR1 (30-75)
Jack Pine/Pin Oak		<1	SM (5-15) FR1 (30-75)
Dry Mesic Forest/Mesic Forest	**7**	**<1**	
White pine	7	< 1	FM1&2 (5-100) FR1 (30-75)
Mesic Forest	**60**	**72**	
Paper birch	8	26	FR1 (30-75)
Yellow birch	16	17	FR4 (350-1000)
Sugar maple	6	15	FR4 (350-1000)
Red maple	4	10	FR4 (350-1000)
Hemlock	26	4	FR4 (350-1000)
Wet Mesic Forest	**22**	**17**	
White cedar	14	11	FR4 (350-1000)
Balsam fir	8	6	FM1&2 (5-100) FR1 (30-75)
Black ash mix	<1	< 1	FR4W >1,000
Wet Forest	**2**	**< 1**	
Black spruce	2	< 1	FR1 (30-75) FR3W & 4W (>1000)

1 Original community types taken from Ventura and He (1993) and converted into Wisconsin Natural features Inventory community types (with the exception of beach, beaver flowage, clearing, and water).
2 Source: Finley 1976 (GLO circa 1840-1850)
3 Source: Ventura and He1993. This information reflects the percent of acres where the tree species is the dominant type of mixed forest types.
4 Source: Dickmann & Cleland (collection of data) FM = Forest Maintenance, FR = Forest Replacement, CM = Community Maintenance, SM = savanna maintenance.

The vegetation present on the Apostle Islands during presettlement times was an expression of the cumulative interactions of the climate, geology, landforms, soils, water table conditions, and the predominant natural disturbance regimes in the area over the past 3,000 years. These conditions were relatively stable over that timeframe. Prior to European settlement of the area, forest vegetation was predominantly hemlock, white pine, sugar maple, yellow birch, and white birch. Canada yew was the dominant shrub in the understory at that time.

Table 3.1.6-1 presents the presettlement and current vegetation types for the Apostles and the percent acres of each type (presettlement data derived from Government Land Office GIS (Geographic Information System) data; current vegetation Ventura and He 1986). Several of the tree species can be found in more than one ecological community type but were placed into a single class based upon a stronger probability of occurrence. One exception is white pine which has a wide tolerance for both moisture conditions and soil type. This species was subsequently placed into a combination of the Dry Mesic and the Mesic Forest classes. The data in Table 3.1.6-1. shows that white pine was historically more prevalent than it is today. This is consistent with the logging history of the islands that indicates selective harvest of this species.

Within the Mesic Forest category there is a reduction of hemlock, a late successional species, from presettlement times to today. This abundance has changed from 26 to 4 percent in current forests. Again these trends are consistent with logging records which show selective removal of hemlock from the islands. Concurrently, paper birch, an early successional species, shows an 18% increase, and red and sugar maple show similar, but smaller increases. An increase in these species following a forest replacement type of disturbance such as harvesting is consistent with successional pathways identified for the Mesic community type (Coffman et al. 1984).

The Wet Mesic Forest type shows a slight decrease between presettlement and today from 22 to 17 percent. Three percent of this difference can be attributed to the removal of cedar, which is again consistent with harvesting records.

The moist, maritime climate of the Apostles, the island nature of the Park, the soil conditions that promote the likelihood of tip-up, and the predominance of northern hardwoods-hemlock forests present during presettlement times all support wind as the dominant disturbance regime for the Park.

Coarse woody debris (CWD) is defined as “Sound and rotting logs and stumps, and course roots in all stages of decay, that provide habitat for plants, animals, and insects, and a source of nutrients for soil structure and development” (Stevens 1997). Coarse woody debris serves several ecological roles including those related to forest productivity through vigorous growth, habitat and structure, geomorphology, and long-term carbon storage.

Forest productivity is increased in several ways by the presence of CWD. It acts as a source of varying size classes of wood that increase the long-term volume of organic matter into the soil thus acting as a steady source of nutrients in the ecosystem for decades. It provides habitat and structure for numerous species of decomposer organisms, and can serve as moist refugia for ectomycorrhizal fungi that are essential for healthy tree growth during stressful dry periods. Coarse woody debris can provide sites for nitrogen-fixing bacteria, also important to healthy

vegetative growth. Coarse woody debris also frequently provides microsite conditions necessary for the regeneration of new trees.

Coarse woody debris serves as habitat for many species of plants and animals. It can provide sites for microbial decomposers such as actinomycetes, bacteria, and fungi; and moist microsites for roots, plants, fungi, insects, worms, and amphibians. This ecosystem feature may be especially important during times of stress such as drought, temperature extremes, or natural disturbance such as fire. Cover is also provided for both prey and predators, and travelways are provided across streams, the forest floor, and across snow. Burrows, dens, and nest sites are also provided. The majority of CWD in streams originates from upland sites and provides habitat for several species of aquatic organisms and for fish. This component in the stream environment provides surface area for food sources to accumulate; it also provides cover from both predators and temperature extremes, and serves to create pools by slowing water flow.

Woody debris also functions in a geomorphological capacity to stabilize slopes, prevent erosion, and slow storm runoff. Any size of woody material lying across a slope can slow the movement of soil down the slope. Finally, coarse woody debris can provide a slow release of carbon to the environment as decay proceeds.

Coarse woody debris goes from a solid state to a broken down state in different ways and at different rates depending upon the ecological community and associated natural disturbance regime. In general, a community with a frequent, stand-maintaining fire regime such as a pine barrens is expected to have lower amounts of CWD than an ecosystem with very infrequent fires such as a hemlock-hardwood forest. The more frequent fires associated with a pine barrens community prevents the accumulation of large amounts of CWD. In contrast, woody debris would be expected to be greater in more mesic forests. In these forests simple decay is the primary process that cycles woody debris from the solid to the chemical state. Apostle Islands National Lakeshore is approximately 90% mesic or wet mesic forest.

In 1998 Brown's Transects for dead and down woody debris were completed on 9 of the Apostle Islands in 6 different habitat types. Brown's Transects are used to classify the number of coarse woody debris pieces into different size classes along transects. Table 3.1.6-2 summarizes the number of logs greater than 3 inches in diameter/foot by community type. As can be seen from this table the number of logs found in the Old Growth Conifer Forest is more than twice that found in the Pine Forest.

Table 3.1.6-2. Number of logs greater than 3 inches in diameter per foot in various community types and the associated Islands.

Community Type	Islands	Number 3+ in. Logs/Foot
Old Growth Conifer Forest	Devils, Raspberry	0.059
Northern Hardwood Hemlock	Bear, Oak, Outer, & Stockton	0.058
Northern Hardwood/Sugar Maple	Many	0.040
Old Growth Hemlock	Outer	0.034
Northern Hardwoods Mixed	Many	0.028
Pine Forest	Long, Outer, and Stockton	0.025

Coarse woody debris was also characterized in the 200 acre Old Growth Hemlock community on Outer Island (Tyrell 1991). The distribution of logs across 5 decay classes (recent, solid, solid-decayed, decayed, and very decayed) was determined. The data indicated that this community has reached a state of equilibrium between inputs and decay. This situation only occurs after sufficient time has elapsed for trees to have attained sufficient size, for death of the tree, and 50-200 years to allow for moderate to almost complete decay. This stand is believed to be approximately 385 years old.

3.1.7 Fuels

Fuels can be defined as all materials, living or dead that are available to burn. Fuels have been grouped into fuel models to predict fire behavior (Anderson 1982). Tables 3.1.6-2 and 3.1.6-3 describe 4 Fuel Models for the community types present in the Park. The typical fire behavior features for each type are presented in Table 3.1.7-1. The majority of the Park falls into Fuel Model 8 which usually has a moderate fuel loading, a slower rate of spread, and low flame length. Under severe weather conditions such as drought, or those conditions involving high temperatures, low humidities, and high winds it is conceivable that fires could more closely follow Fuel Model 9. In addition, Fuel Models 8 and 9 can alternate seasonally, going from 9 in the Spring prior to vegetation green-up, to 8 throughout the summer months, and then reverting back to 9 after vegetation cures for the season.

Table 3.1.7-1. Fuel models associated with community types at the Park (from Anderson 1982).

Fuel Model	Fuel Model Type	Typical Community (in the Park)	Total Fuel Loading (tons/acre)	Rate of Spread (chains/hour)	Flame Length (feet)
1	Grassland – short grass	Lawn grass	0.74	Rapid	Low
8	Forest – closed timber litter	Short-needle conifers or leafed-out hardwoods	5.00	1.6	1.0
9	Forest – hardwood litter	Long-needle conifers or fall hardwoods	3.50	7.5	2.6
10	Forest - timber	Older, insect- or disease- ridden forests, wind-thrown forests	12.0	7.9	4.8

Table 3.1.7-2 displays the percentage of the Park by fuel model type during presettlement and current times. The majority of the communities present during both time periods fall into Model 8. This indicates that land use practices have not shifted acres from one fuel model to another over this timeframe. The majority of FM10 is found on Devils, North Twin, the north end of Outer, and Raspberry islands (see Fuel Model map)

Table 3.1.7-2. The percent of the Park by fuel model during presettlement and current times.

Fire Behavior Fuel Models*	Presettlement Condition (Percent of National Lakeshore)[1]	Current Condition (Percent of National Lakeshore)[2]
Fuel Model 1	<1	<1
Fuel Model 8	94	93
Fuel Model 9	<1	<1
Fuel Model 10	5	4
Other**	<1	1.5

* Anderson 1982.
** Includes beaches, and wetlands.
[1] Derived from presettlement vegetation GIS data (WI DNR 2003)
[2] Derived from Ventura and He (1993).

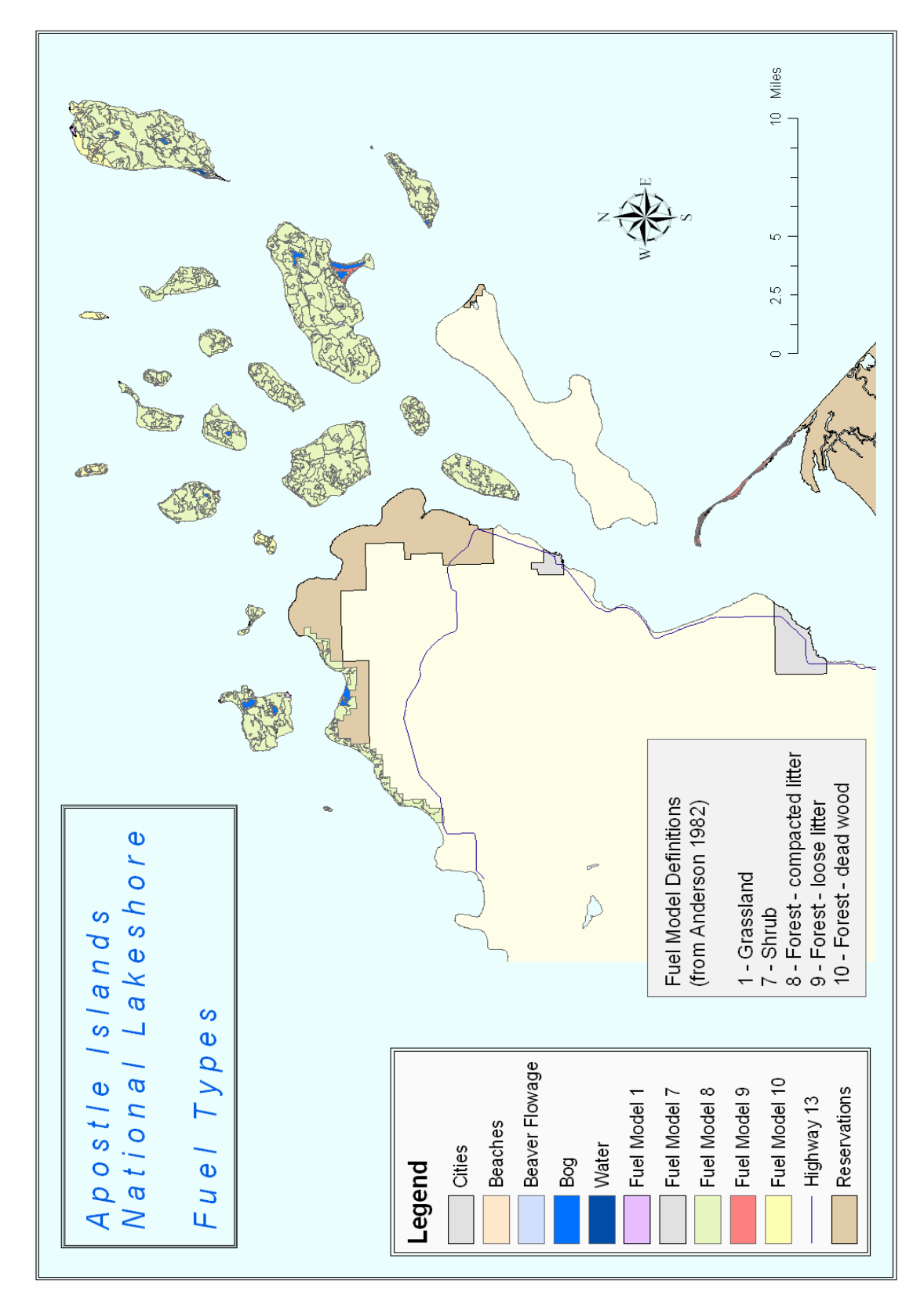

Figure 3.1.7-1. Fuel Types

3.1.8 Rare, Threatened and Endangered Species

Apostle Islands National Lakeshore provides important habitat for Federally and state listed species and is specifically directed through the Endangered Species Act (ESA) and National Park Service policy to protect these species and their habitats.

There are four Federally and/or state listed species found in and around the Park. They include piping plover (Federally and state endangered; see Appendix H for scientific names), peregrine falcon (state endangered), gray wolf (Federally threatened and state threatened) and the bald eagle (Federally threatened). The bald eagle is in the process of being delisted, but still remains a State species of concern and is protected under the Bald Eagle Protection Act. The Federal government has begun the process to de-list wolves and it is anticipated that the state of Wisconsin will de-list the gray wolf as populations increase. In 2000, Canada lynx was listed as a threatened species in the contiguous 48 United States. The Park falls within the potential southern range limit of the lynx, however, no verified sightings have ever been recorded in the Park. Lynx is a species of the boreal forest of which there is only a limited amount in the Park.

Reproducing bald eagle populations occur in the Park and are annually monitored in cooperation with the Wisconsin Department of Natural Resources (DNR). In 1998, a pair of piping plovers nested and successfully reared three chicks on Long Island, the first nesting activity in the Park since 1983. Nesting success has been sporadic since then, with achievement in 2001. Long Island and the Michigan Island sandspit were designated as critical habitat by the U.S. Fish & Wildlife Service in 2001. The Apostle Islands provide important habitat for spring and fall migratory peregrine falcons. There are no gray wolves that are known to live permanently in the Park, however, potential habitat exists that could be used by visiting packs or individuals. Wolf sign and unconfirmed sightings have been observed within and adjacent to the Park.

Apostle Islands National Lakeshore provides important habitat for five state endangered plants, 13 State threatened plants, and 26 State species of concern (see Appendix I). Table 3.1.8-1 lists the state endangered and threatened plants.

Table 3.1.8-1. Wisconsin State Endangered and threatened plant species (see Appendix I for scientific names.

Common Name	Location
State Endangered Species	
Lake cress	Stockton
Moonwort	Stockton
Butterwort	Outer, Devils, Ironwood, Otter
Mountain cranberry	Mainland Cliffs
Satiny willow	Otter
State Threatened Species	
Calypso orchid	Stockton
Beautiful sedge	Devils
Coast sedge	Stockton
Shore sedge	Devils, Long, Stockton
Michaux's sedge	Stockton
Drooping sedge	Oak
Broad-lipped twayblade	Mainland, Oak
Marsh grass-of-parnassus	Outer
Spike trisetum	Presque Isle Point
Flat-leaved willow	Devils
Northern Gooseberry	Devils
Plains ragwort	N.Twin, Rocky, Outer
Russet cottongrass	Long Island

3.1.9 Wildlife

A variety of wildlife species utilize the many habitat types available in the National Lakeshore. Several types of insects and arachnids are present but few inventories of these groups have been completed. Forty species of fish live in and around Lakeshore waters. In addition, there are 22 species of amphibians and reptiles that have been documented within the National Lakeshore. Important habitats and habitat features for some of these species include moist, rich woods, and coarse woody debris which provides cover and microsite conditions favorable for frogs and salamanders. Streams, lagoons, and other wetland communities provide habitat for some of these species as well as turtles.

The Park is also an important nesting area and migratory pathway for birds. Approximately 150 species have been detected during breeding bird surveys. Forested communities provide concealed sites for nesting. Gull and Eagle islands serve as nesting colonies for cormorants, gulls, and herons. Sand beaches provide habitat for piping plovers which have been observed on Long Island. Surveys have indicated that 230 species move through the archipelago during the fall migration.

Consistent with island biogeography theory (MacArthur and Wilson 1967), the islands have a lower diversity and abundance of mammals compared to the mainland. Approximately 25 percent more species are found on the Mainland Unit compared to the islands. The Mainland Unit supports eastern and least chipmunks (see Appendix H for scientific names), porcupine, and skunks while these species are absent from the Islands.

There is presently a concentrated population of approximately 26 black bears (2.0+ bears/square mile or 0.8/km^2) on Stockton Island. Resident black bears also occur on the Mainland Unit, and Sand and Oak Islands, and transient numbers of bears visit other islands, such as Basswood, and Long. Bears have been seen for the first time recently on distant islands including Devils, Outer, and North Twin Islands. Important food sources include berry production which is locally abundant around the Stockton tombolo and other open areas such as bogs and sandscapes. Mast production of acorns is probably locally abundant in good years on Oak and Long Islands.

Reproducing white-tailed deer populations were rare in and around the Apostle Islands prior to European settlement and logging of the region. Deer numbers increased on the mainland as the result of habitat modification from logging and deer began to colonize some of the islands. In the 1940s and 1950s, hardwood logging and subsequent fires occurred on the islands. This was followed by extensive growth of early successional tree species such as aspen and a subsequent irruption of deer populations. By the early 1960s, hunting pressure, loss of habitat from development of second-growth forests, and starvation caused a major decline in Park deer numbers. Presently, a very small number of deer occur year-round on Basswood and possibly Stockton and Long Islands. In addition, there was a sudden increase of deer on Sand Island around the year 2000. It was estimated that 50 deer were on Oak Island during an aerial estimates on February 15, 2000. A combination of surveys including aerial, pellet, and browse indicate that the population on Sand is currently 10 per square mile. Deer occasionally visit other islands. There is little historical evidence of beaver activity in the Apostle Islands but they were probably present in small numbers. Research by Swain (1981) indicates that during presettlement times, most of the islands had a continuous canopy of northern hardwood-hemlock-white pine forest, while the remaining islands were dominated by white cedar-yellow birch-yew forests, habitats which would not have supported beaver populations to any degree. Following logging and slash fires (1870-1970), and revegetation however, beaver became established and colonized all of the available watersheds on Stockton and Outer Islands. With the return of second-growth forests (and bear predation on Stockton Island), beaver populations have dropped dramatically. No beaver have been found on Stockton Island since a 1994 survey. Although beaver were a very small part of the pre-logged ecosystem on the islands, their ponds currently provide habitat for wildlife species, most notably amphibians, birds, mink, and otter. Beaver populations had been fairly stable on Outer Island, however their numbers have declined to only 3 colonies.

3.1.10 Wilderness

The National Park Service evaluates all lands and waters under its jurisdiction for wilderness suitability in accordance with the Wilderness Act (1964) and the Eastern Areas Wilderness Act (1975) as well as Department of Interior and National Park Service guidelines for wilderness management and preservation. During preparation of the Apostle Islands National Lakeshore General Management Plan (1989) it was determined that approximately 97 percent (41,054

acres) of the may be suitable for wilderness. Subsequently these lands were placed into a Natural Zone category and have been managed to "preserve their potential wilderness values" until a formal wilderness study is completed for the Park. In the spring of 2004 the Park released the final wilderness Study/Environmental Impact Statement (EIS) to the public. The National Park Service's preferred alternative recommended approximately 80% of the Park for wilderness designation. In May of 2004 with the release of the Record of Decision, this portion of the Park became proposed wilderness and in December 2004, the proposed acreage was designated as wilderness.

The two wilderness Acts provide criteria for lands to be included into the wilderness system. Some of these include "minimal levels of development, opportunities for primitive, unconfined recreation, and opportunities for solitude" (Watson and Osman 1998). In addition wilderness designation may be sought for areas that "contain ecological, geological, or other features of scientific, education, scenic, or historical value." The Eastern Wilderness Act further states that the wilderness character of the land should be promoted to maintain "its specific values of solitude, physical and mental challenge, scientific study, inspiration, and primitive recreation for the benefit of all the American people of present and future generations."

3.1.11 Soundscapes

Noise is defined as unwanted sound (INCE 1995). The particular pattern (location, duration, timing and frequency) of human activities gives rise to a perception of noise. The loudest sounds that can be detected comfortably by the human ear have intensities that are 1 trillion (1,000,000,000,000) times larger than those of sounds that can just be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such a representation is called a sound level. The loudness of sound as heard by the human ear is measured on the A-weighted decibel (dBA) scale. Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort and eventually pain at still higher levels (Department of Defense 1978). Examples can be found in Table3.1.11-1.

Table 3.1.11-1. Common noise levels and their effects on the human ear.

Source	Decibel Level (dBA)	Exposure Concern
Soft Whisper	30	Normal safe levels
Quiet Office	40	
Average Home	50	
Conversational Speech	66	
Busy Traffic	75	May affect hearing in some individuals depending on sensitivity, exposure length, etc.
Noisy Restaurant	80	
Average Factory	80 - 90	
Pneumatic Drill	100	Continued exposure to noise over 90 dB may eventually cause hearing impairment.
Automobile Horn	120	

Certain land uses, facilities, and the people associated with these noise levels are more sensitive to a given level of noise. Such "sensitive receptors" include schools, churches, hospitals, retirement homes, campgrounds, wilderness areas, hiking trails, and some species of threatened or endangered wildlife. Recommended land use and associated noise levels are illustrated in Table 3.1.11-2). The only land use category in the table below that is well-represented within Apostle Islands National Lakeshore is "Natural Recreation Areas."

In recent decades, noise has become a controversial issue in certain national Parks, as many Parks that retain their historic appearance no longer sound as they once did, due to the widespread proliferation of motorized and human-generated noise from a variety of sources. In response, NPS management policies call for the preservation of, "to the greatest extent possible, the natural soundscapes of Parks" (NPS 2000, Section 4.9). Human activities that generate noise are to be monitored, and it is NPS policy to prevent or minimize noise that affects the natural soundscape or exceeds levels appropriate for visitor uses. Section 8.2.3 of the 2001 *Management Policies* directs the NPS to "strive to preserve or restore the natural quiet and natural sounds associated with the physical and biological resources of Parks." Where use of motorized equipment is necessary and appropriate, the "least impacting" equipment and vehicles should be used, consistent with public and employee safety.

Table 3.1.11-2 Recommended Land Use Noise Levels (HUD 1991)

Land Use Category	**Noise Levels**			
	Clearly Acceptable	Normally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential	< 60	60-65	65-75	> 75
Commercial, Retail	< 65	65-75	75-80	> 85
Manufacturing	< 55	55-70	70-80	> 80
Agriculture, Farming	< 75	> 75		
Natural Recreation Areas	< 60	60-75	75-85	> 85
Hospitals, Schools, Libraries, Churches, Nursing Homes	< 60	60-65	65-75	> 75
Playgrounds	< 55	55-65	65-75	> 75

Some conservationists argue that auditory solitude, that is "quietude," was recognized by the drafters of the 1964 Wilderness Act and is implied by the act's language (Matzner 2001). NPS policy on wilderness management explicitly recognizes the incompatibility of human-made noise with wilderness. Since 80% of Apostle Islands National Lakeshore is proposed for wilderness designation, and managed so as not to impair its wilderness attributes, management must consider potential impacts of motorized equipment to the character, esthetics, and traditions of wilderness (NPS 2000, Section 6.3.4.3). Many visitors to the Park use motorboats, snowmobiles and airplanes for both access and recreation. Passing snowmobiles and outboard motorboats can reach levels of 80 dB while propeller aircraft generate 120 dB (Roeser no date). The noise from these sources, while intermittent (not constant) does occur on a daily basis and penetrates well into the backcountry and wilderness areas of the Park. The legislative history of the Wilderness Act, however, makes clear that intrusions from outside of the boundaries of an area are not

subject of wilderness regulation. Throughout North America, the limited research and surveys to date into attitudes of backcountry users toward mechanical and other human noise (loud voices, rowdiness, radios, tape-players, etc.) do suggest that noise can be annoying and interfere with visitor experience.

In addition to intruding on wilderness solitude, another potential impact of human and motorized noise is on wildlife. Some scientists believe that around the world, noise pollution is contributing to the depletion of wildlife populations, although this is very difficult to quantify and has not been specifically documented at Apostle Islands in particular. Research into the effects of noise on wildlife has been growing rapidly since the 1970s, yet often presents contradictory results because of the complexity of factors and the difficulty of isolating variables. Nevertheless, most researchers agree that noise can affect an animal's physiology and behavior, and if it becomes a chronic stress, can be detrimental to an animal's energy budget, reproductive success and long-term survival (Radle 1998). The long-term effects from medium to low-level noise intrusion need much more research, with emphasis on threatened and endangered species. The synergistic effects of noise with other stressors on animals also need investigation (Cornman 2001).

3.2 CULTURAL RESOURCES

The cultural resources of the Apostle Islands include the sites, structures, objects, and people associated with or representative of many stages of human history in the Great Lakes region: prehistoric and historic aboriginal cultures, early European contact period (fur trade, military and missionary activity), the post-1850s era of permanent white settlement with its accompanying activities (shipping, commercial fishing, agriculture, logging, brownstone quarrying, tourism and recreation), and modern Ojibwe life and culture.

The six Apostle Islands light stations are perhaps the best known of the Park's historic resources, but numerous other important cultural sites exist within the Park. While a number of cultural resource sites are currently listed on the National Register of Historic Places, many others still await formal evaluation. The number of properties on the National Register is likely to increase substantially in the future. Multiple property nominations have been drafted for the brownstone quarries and logging camps, and a historic district nomination is in preparation for the Rocky Island fishing settlement. The Wisconsin State Historic Preservation Office determined in 2002 that the Stump-Stalker cabin on Bear Island and the West Bay Club on Sand Island are eligible for the National Register, and other probable eligible sites remain to be evaluated.

3.2.1 Resource Types and Historic Themes

For management purposes, the National Park Service groups cultural resources into five major categories:

- Historic And Prehistoric Structures
- Archeological Resources
- Cultural Landscapes

- Museum Objects
- Ethnographic Resources

The Park's historic structures are the cultural resources most at risk from fire. The overwhelming majority of them are made from wood. Many are subject to additional risk factors; for example, most fishing cabins are built on piers, potentially allowing a ground fire access beneath the building, while Sand Island's "Plenty Charm" cottage makes extensive use of an early type of plywood, containing highly flammable adhesives. Should a fire ignite at any island structure, limitations on access make effective suppression virtually impossible.

The archeologist Charles Haecker has written, " A strong likelihood exists that a dilapidated, unoccupied historic frame structure eventually will be destroyed by fire." (Haecker, 1991) Haecker's blunt, descriptive phrase applies to many of the Park's historic structures.

However, the acute vulnerability of one class of resources should not allow the potential impacts of fire on other resource types to escape attention. For example:

- Archeological sites in the archipelago are frequently accompanied by surface scatter; ceramics, glassware, and even metal objects can be damaged if fire exposure is intense enough.

- Cultural landscapes can experience both beneficial and adverse impacts from fire; prescribed fire is a useful tool in maintaining farmstead clearings, but fire can destroy a historic orchard.

- Likewise, fire can have beneficial or adverse effects on plant communities- such as berry patches and sugar bushes- used by traditionally associated populations.

- While some portions of the Park's museum collection are housed in a controlled storage facility, thousands of artifacts are kept on display in more vulnerable field locations.

Seven general themes in the history of the Apostle Islands region and the overall evolution of the cultural landscape have emerged. Those themes are as follows:

- Native American Traditions And Culture
- Great Lakes Navigation
- Farming The Cutover: Agriculture
- Tourism & Recreation
- Logging Industry
- Quarries
- Commercial Fishing

Each of the seven listed themes will be examined briefly, along with a synopsis of associated resources.

3.2.2 Native American Traditions and Culture

Aboriginal people occupied the islands and peninsula for millennia before the arrival of Europeans. The demographic composition of the Apostle Islands and the Chequamegon area is hard to determine before the late 1600s; what is known with reasonable certainty is that for the last 400 years, the Apostle Islands have in some manner been used by the ancestors of the people known as the Lake Superior Ojibwe. Long Island, in particular, figures prominently in Ojibwe history. Jesuit missionaries traveled through the Lake Superior area in the mid-1600s and encountered some Ottawa-Ojibwe bands there. After 1671, the Chequamegon Bay area, including LaPointe and the Apostle Islands, was described as home to a variety of ethnic groups including the Huron, Ottawa, Potawatomi, Sauk, Fox and Ojibwe.

Archaeological Resources

Archaeology and geomorphology suggest that the islands were occupied since Paleoindian times until the historic period. The earliest known site was found by Salzer and Overstreet near Chequamegon Bay (Salzer and Overstreet 1976); the site has a late Duluth beach deposit dated around 11,000 BP and contains stone tools and chert materials. Beaches on islands date to 10,500 to 9,500 BP and suggest a possible Paleo-Indian occupation. The next prehistoric occupation dates to the late Archaic phase; unfortunately, water level fluctuations may have flooded living surfaces during the Archaic period.

No early or middle Woodland sites were found in the 1976 survey, with the possible exception of the Morty Site on Stockton Island. Salzer and Overstreet explain that non-ceramic seasonal or special activity occupations are present but have not been recognized due to a lack of diagnostic artifacts. At the time habitation sites were not yet recorded. In contrast, the late Woodland occupation is well represented in the Islands. Late Woodland ceramic assemblages are similar to the Lakes phase of the Northern Lakes area and are best represented at the Morty Site.

Sites dating to the protohistoric period are represented at the Morty Site, and may be related to Huron and Ottawa refugees who occupied Chequamegon Bay during the mid-late seventeenth century. The P-flat Site on Manitou Island contains quartz and fire-cracked rock. It is an historic expression of island fishing by aboriginal people. Although the ethnic affiliation of its inhabitants cannot be completely ascertained, Richner (1991) suggests that it may be Ojibwe or Proto-Ojibwe.

There are numerous, lesser-known prehistoric and historic sites on Otter, Rocky, Bear, Stockton, Manitou and other islands, but it is important to note that less than 25 percent of the Park's acreage has been surveyed at even a minimal level.

Ethnographic Resources

Only limited research has been completed for the ethnographic significance of the Apostle Islands to associated Native American groups. In 1999, a team from the University of Arizona conducted field interviews with Ojibwe elders to begin the process (Stoffle 2000). This study provided valuable preliminary information; however, given the archipelago's historic central role

to the Ojibwe, it is likely that there is much yet to be learned.

In the course of the University of Arizona study, Native consultants reported that all the islands were used by their people, primarily on a seasonal basis. Responses evidenced a pattern according to which the islands closer to the mainland were generally inhabited for longer periods of time than those further from the shore. Consultants also stressed that environmental constraints and uneven resource distribution both spatially and temporally, forced Ojibwe people to constantly move from island to island, to the mainland, and to places further in the interior.

The islands, for instance, constituted a good source of various berries; all consultants stressed their ancestors' role in maintaining the berry patches flourishing by practicing annual controlled burning. Maple sugar collecting is another activity frequently mentioned; as one example, there is a well-known sugar bush on Oak Island.

In addition, Ojibwe people utilized the Apostle Islands for fishing activities, the collection of medicinal plants, and hunting. Consultants reported that not only Ojibwe but also Menomonee and Potawatomie people used to come to the islands for berries in historic times. Use of the island resources was not limited to persons living in the local area; Ojibwe bands from the entire Lake Superior region utilized the Apostle Islands.

3.2.3 Great Lakes Navigation

F. Ross Holland, author of the standard reference work, *Great American Lighthouses* (1994), has described the six light stations of the Apostle Islands as “the largest and finest collection of light houses” in the United States. This grouping, comprised of nine standing lights and the ruins of a tenth, offers a cross-section of construction types and architectural styles illustrating the evolution of American lighthouse design. Today each of the Apostle Islands light stations remains an active aid to navigation, demonstrating the continuing importance of these light stations to Great Lakes ship traffic and the nation's commerce.

The cultural landscape of the Apostle Islands light stations remains remarkably intact. Numerous lighthouses have been preserved nationally, but in many cases the only structure remaining on site is a lighthouse in isolation -- the ancillary buildings such as oil houses, privies, barns, and work shops were all lost to the ravages of time before their contributions to the cultural landscape and historic context of the lighthouse service could be recognized. In contrast, the Apostle Islands light stations, with their complex landscapes well preserved, provide a rich portrait of the era when lighthouse keepers and their families lived and worked on these remote islands, and of the role they played in Great Lakes maritime history.

The light stations of the Apostle Islands National face a classic wildland-urban interface hazard. Two serious, and inter-related, threats to the integrity of the light stations and their landscapes are fire and vegetative succession. As historic lighthouse clearings fill in with encroaching vegetation, fuel buildup around the vulnerable buildings poses increasing peril to these irreplaceable treasures.

Figure 3.2.3-1: Auxiliary Buildings, Raspberry Island Light Station.

The light stations are not the only features associated with the theme of Great Lakes navigation. Several well-known shipwrecks lie in the waters of the archipelago both within and just outside the Park boundary. While submerged cultural resources are by their nature safe from the risk of combustion, the indirect impacts of a nearby terrestrial fire, and concomitant suppression activities, have not been evaluated.

Michigan Island Lights

The first Michigan Island light, built in 1856, is located at the southern point of Michigan Island on a high clay bluff overlooking Lake Superior. A second, much taller, tower was erected adjacent to it in 1929. The complex consists of a rubble-stone masonry tower with attached one-and-one-half-story keeper's dwelling built in 1856, a brick fog signal building, a two-story brick keeper's dwelling constructed in 1929, a one-and-one-half-story wood-frame assistant keeper's dwelling, the 1929 metal light tower, a small single-gable utility building, a dock, tramway, and a wood-frame privy, all located on Michigan Island Also a part of the Michigan Island Light Station but physically separate from it is the Gull Island Light, a skeletal tower erected on Gull Island in 1929. The historic clearing has largely filled in since the light was automated. The 1856 tower is completely hidden from lake-level view, and the forest edge is but a few yards from the structure.

Gull Island Light

The Gull Island Light, located on a tiny islet east of Michigan Island, is a black pyramidal steel tower, erected shortly after construction of the new Michigan tower. It serves to warn shipping of the shoal water to the northeast, where several ships wrecked in the late nineteenth century.

LaPointe (Long Island) Light Station

The LaPointe Light Station consists of three distinct sites: the Chequamegon Point Light, a skeletal lighthouse at the western tip of Long Island; the New LaPointe Light complex, about 4,000 feet east, with a cast-iron light tower, oil house, and triplex keepers dwelling; and the ruins of the original LaPointe Lighthouse, located approximately mid-way between the two. The first La Pointe Lighthouse, built in 1858, is shown in historic photographs to have once stood within a few feet of the water's edge, but over time the shoreline has moved much farther out. The ruins of the old lighthouse, and associated oil house, are now located in the middle of the island, with brush and trees obscuring their location. With a jackpine forest nearly obliterating the historic clearing, and trees literally brushing up against the buildings, the LaPointe light station is especially vulnerable to fire.

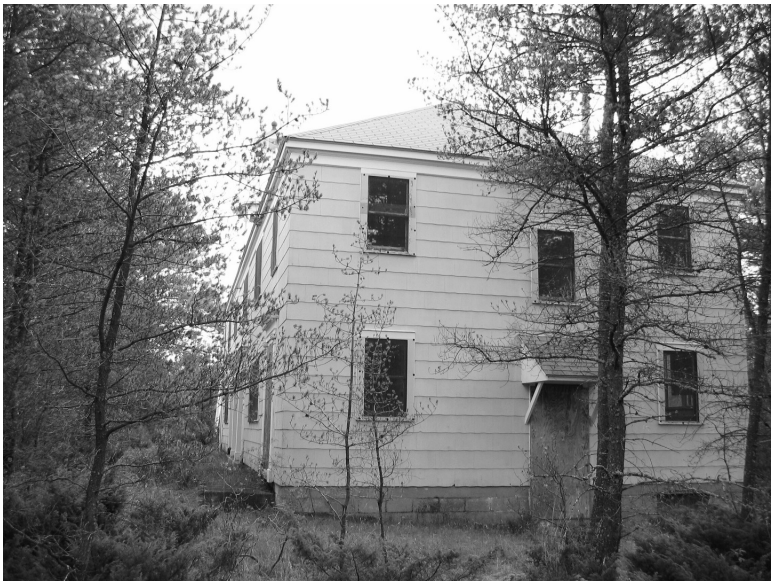

Figure 3.2.3-2: Triplex Keepers' Dwelling, LaPointe Light Station.

Raspberry Island Light

The Raspberry Island Light Station is located on the southwest end of Raspberry Island. The complex consists of ten buildings and seven structures. The buildings are an integrated, wood-frame lighthouse keeper's dwelling and tower, two wood-frame privies, four wood-frame utility buildings, a brick oil house, and a brick fog signal building. The seven structures are a wooden daymark located near the southeast corner of the light station, a flagpole located in front of the lighthouse, a wooden swing located behind the lighthouse, a 1957 navigational beacon mounted on a pole in front of the fog signaling building, a stairway and tramway connecting the dock with the lighthouse on the bluff above, concrete walkways, and a wooden boathouse and dock. The majority of the historic clearing has filled in with forest, and the proximity of the forest edge places the wood frame buildings of the complex at risk from wildland fire spread.

Outer Island Light

The Outer Island Light is located on the northern end of Outer Island. The station consists of a conical brick tower with attached three-story brick keeper's house, a brick privy, a brick oil house, a wood-frame fog signal building, and a tramway connecting the dock with the lighthouse complex above.

Sand Island Light

The Sand Island Light is located at the northeast tip of Sand Island. The light station consists of a sandstone keeper's dwelling with attached tower, a brick privy, and a brick oil house. The historic clearing was cleared out in the early 1990s, but is rapidly filling in with vegetation, notably balsam fir.

Devils Island Light

The Devils Island Light is located on the northern end of Devils Island. The light station consists of two keeper's dwellings, two hipped-roof brick oil houses, a gable-roofed wooden building housing fog-signal equipment and electrical generators, a pump house, and a small metal truss tower formerly used as a radio tower. Much of the historically cleared area has grown up in balsam fir and thick brush. The lighthouse complex also includes a boathouse and dock at the south end of the island, approximately one mile from the lighthouse, connected to the rest of the complex by a single-lane dirt road. There is also a dressed stone "hoist-house" located approximately one-quarter mile south east of the light house, now completely surrounded by encroaching forest.

3.2.4 Agriculture

Well before the arrival of Europeans, Native Americans raised crops on Madeline Island and elsewhere in the region. Travelers reported that Hurons and Ottawa grew corn in the Chequamegon Bay region, while the Ojibwe grew pumpkins, squash, and corn. As European settlement grew, entrepreneurs and developers made attempts at establishing agriculture in the area. Farms were established on Rocky, South Twin, and Ironwood Islands, but the schemes were short-lived. More substantial operations took place on Michigan, Basswood, and especially Sand Islands, where the most extensive and successful agricultural settlement on the Apostle Islands evolved. With a year-round community that numbered about one hundred at its peak, Sand Island attained a level of settlement exceeded only by Madeline Island.

But the expected agricultural boom never took place, and the last island farm was gone before the end of World War II. With their isolation and limited accessibility, farms on the islands could never compete economically with those on the mainland. Today, the story of the island farms is told by ruined buildings, the outlines of fields, and relict orchards.

Agricultural Sites at Apostle Islands National Lakeshore

Basswood Island: McCloud-Brigham Farm

Civil War veteran Richard McCloud acquired a homestead on Basswood Island in 1865, and by 1870, had a successful farm that supplied produce to the crews working at the neighboring brownstone quarry. The 1923 death of McCloud's successor, Elisha Brigham, signaled the end of farming on Basswood Island. No structures remain standing at the site, but the remains of building foundations, an orchard, fence lines, and other evidence of agricultural activity are clearly visible. Stone walls criss-cross through the encroaching forest, giving evidence as to former clearings. An archeological survey conducted in the early 1980s found numerous artifacts, including canning jars and household goods (Martin 1981).

Basswood Island: Rudd Farm

Following McCloud's pioneering enterprise, entrepreneur Charles Rudd cleared land for a farm near the island's northwest corner. The Rudd Farm is associated with both early agriculture in the Apostle Islands and with the lumbering industry. Historic accounts report a tanbark operation at the Rudd Farm as well as possible cordwood sales to steamships. The site has not been evaluated for possible historic significance. Surface surveys performed in the 1980s reported finding building foundations (Martin 1981).

Michigan Island: Pendergast Orchards

Perhaps the single most influential figure in the area's agricultural development was a Michigan Island lighthouse keeper, Roswell Pendergast. Appointed keeper in 1869, Pendergast planted thousands of fruit trees on the island; soon he was selling the apples, cherries, peaches, plums and pears, and supplying nursery stock to farmers around the region. Although there is abundant documentation of Pendergast's activities, little physical evidence has been located. One gnarled apple tree stands in the woods not far from the 1856 lighthouse; while the fruit variety it produces is not familiar to modern orchardists, a definitive estimation of the tree's age has yet to be made.

Oak Island: Armstrong Farm

One of the earliest permanent Euro-American habitations within what is now the Park was the Oak Island homestead of the noted frontiersman and Indian advocate, Benjamin Armstrong. Records indicate Armstrong cleared at least five acres of the island and cultivated field crops such as rye. He also established a wood yard and sold cordwood for fuel to passing steam ships. The site of Armstrong's farm is known to be close to the sandspit at the island's southern extremity, but further archeological investigation is needed.

Sand Island: Shaw-Hill Farm

The southeast tip of Sand Island was settled in the 1870s, when Civil War veteran Frank Shaw purchased 37 acres of land. He eventually expanded his holdings to 183 acres. On retiring, Shaw sold the land to his daughter and son-in-law, Anna Mae and Burt Hill, who operated the farm and resided full-time on Sand Island until 1942. The Shaw-Hill Farm is listed on the National Register of Historic Places. It includes the following structures: the main house, the Post Office, a smokehouse, a log cabin, and a workshop.

Sand Island: East Bay Settlement

During the 1890's a cluster of farmsteads developed by Norwegian immigrants appeared in the East Bay area of the island. Residents earned a living by combining farming with fishing. Most of the buildings have been removed, but traces of several are still apparent, including the foundation of the schoolhouse which served the children of the community from about 1910-1930. Two farmsteads can be readily identified, with disparate levels of integrity.

The Hansen farm at East Bay has by far the greatest degree of integrity among Apostle Island agricultural sites. Buildings at the site include the two-story main house, a guest house, machine shed, wood shed, a structure known as "the Boar's Nest," a twine shed, and ice house. In contrast, no buildings remain standing at the Noreng farm site, but the ruins of several are still quite noticeable, as are the remains of agricultural implements and other artifacts. Field boundaries and an orchard are readily discernible, but are rapidly experiencing the impact of succession and vegetative encroachment.

3.2.5 Tourism and Recreation

By the time the Apostles Island National Lakeshore was established, the islands and mainland had already enjoyed a long history of tourism and tourism-related sites and structures. Tourists began seeking out the Apostle Islands early in the nineteenth century; following the construction of the ship canal at Sault Ste. Marie increasing numbers of leisure travelers, both Americans and Europeans, visited the towns and villages along the Lake Superior shoreline. In the century between the end of the Civil War and the creation of the National Lakeshore, numerous schemes for developing the islands were proposed. Some came and went quickly, others carried on for decades.

Tourist Resorts and Recreational Sites within Apostle Islands National Lakeshore

Sand Island: Camp Stella

Camp Stella, established in the mid-1880s by Ashland businessman and politician Sam Fifield, evolved into a small resort featuring rustic living quarters such as platform tents, a dining hall, and several permanent cabins. By the early 1900s forty or more paying guests were being accommodated daily throughout the summer season. The complex includes 11 contributing

structures, including the unique *Sevona* Memorial Cabin, made from the wreckage of the eponymous freighter that sank off the island in 1905.

Sand Island: West Bay Club

After spending several summers at Camp Stella, a group of Twin Cities businessmen purchased a tract of land on the west side of the island and built their own lodge, the West Bay Club. This Adirondack-style log structure was designed by the noted architect Henry Buechner, and has been determined eligible for the National Register of Historic Places under criterion C, "embodying the work of a master."

Sand Island: Campbell/Jensch cottage

This is the summer home of the prominent, early 20th century Indian agent, Sam Campbell. Currently under a use and occupancy agreement, that is scheduled to expire in 2006. This cottage is potentially eligible for the National Register of Historic Places.

Sand Island: "Plenty Charm"

A small cabin, built by the locally renowned craftsman Clyde Nylen, and widely praised for its elegant design. A National Register of Historic Places nomination is pending. It is currently being considered for adaptive reuse.

Hermit Island: Cedar Bark Lodge

This is a mansion constructed by the owner of the Excelsior Brown Stone Quarry in the 1890s, but later operated as a hotel. It is no longer standing; archeological survey work is yet to be done.

Bear Island: Stump-Stalker Cabin

This is a single-gable, saddle-notched log cabin located on the northeast corner of the island, deemed eligible for the National Register of Historic Places by the Wisconsin SHPO.

Rocky Island Settlement

The Rocky Island settlement complex relates closely to the recreational theme, embodying the transformation of the regional economy from an extraction-based model to its current reliance on tourism and recreation. The site will be described in more detail under the "Commercial Fishing" heading.

3.2.6 Logging Industry

Shortly after the opening of Lake Superior to steamship traffic in 1855, wood yards were established on Bass and Oak Islands, with local newspapers carrying ads touting the availability of good quality, dry hardwood for fuel. By the 1880s numerous sawmills had been established

on the mainland. Logging camps on the islands helped to fill the demands of these mills. Some businesses were small, literally one-man operations; others employed hundreds of men. As the pineries were exhausted by the late 1890's, the pine lumbermen left the islands but less specialized companies moved in to harvest other species. The majority of logging occurred around the turn of the century, and then peaked again in the 1930's and 1940's. A few islands were logged sporadically after that time and logging ceased entirely in 1974.

Logging Sites within Apostle Islands National Lakeshore

Tangible remnants of the lumbering industry take many forms: collapsing cabins on Outer Island, log foundations on Bear, the remains of a narrow-gauge railroad on Outer Island, cattle bones in the woods of Stockton Island. Properties associated with all four stages of the forest products industries exist within Apostle Islands National Lakeshore: procurement of raw material, transportation of raw material to a processing facility, processing, and transportation and sale of the finished product.

In *Historic Logging Sites in the Apostle Islands: A Resource Management Plan* (1984) National Park Service historian Kate Lidfors provided a general overview of logging and lumbering history within Apostle Islands National Lakeshore. Of the thirty-four sites known at the time, Lidfors tentatively identified ten that appeared to merit special consideration as archaeologically important as well as potentially valuable for resource education and Park interpretation.

The ten sites, which are listed in Table 3.2.6-1, covered the full chronological range of logging within the region, from its earliest days to the modern era. Since Lidfors compiled her list, additional undisturbed sites have been identified within the Park. The sites include an especially well-preserved camp site on Bear Island that may have been used successively for white pine logging in the 1890s, hardwood and hemlock in the 1920s, and hardwood veneer in the 1940's.

Table 3.2.6-1: Logging camps identified as "Most Significant" by Lidfors in 1984

Name of Site	Location	Time Period
Trout Point Camp	Stockton	1910-1930
Schroeder Camp 2	Oak Island	1910-1929
Railroad Camp	Outer Island	1923-1930
Sandspit Logging Camp	Oak Island	Pre-1900
Quarry Bay Logging Camp	Stockton Island	1890-1920
Sandspit Camp	Otter Island	Pre-1900
Lullabye Camp	Outer Island	1939-1962
Saxine Creek	Mainland, Mawikwe Bay	Pre-1900
Presque Isle Bay	Stockton	1910-1930
Dock Site	Basswood	Pre-1900

Of the camps identified in the table, only one, Trout Point, has had a thorough archeological survey conducted. The Trout Point Logging Camp is now listed on the National Register of Historic Places.

3.2.7 Brownstone Quarries

The opening of the Bass Island Brown Stone Company Quarry in 1868 signaled the beginning of the brownstone industry in the Chequamegon Bay region. The succeeding three decades witnessed the development of three additional quarries in the islands. Although active quarrying lasted little more than thirty years, in that short time Lake Superior brown sandstone achieved an enduring reputation as a strong and attractive building material, and many prominent buildings throughout the Midwest attest to its popularity.

The Apostle Islands brownstone quarries are a potentially rich source of data about nineteenth century economic development in the Lake Superior region. The quarries' island locations have preserved each site's integrity. A great deal of material evidence relating directly to the quarrying operations remains at each site. In addition to visible artifacts, such as iron rods and chains, there are reports of equipment submerged in the water now present. In addition, the sites where worker housing and other support buildings were located remains undisturbed. Although some surface mapping and survey work has been done, all archeological work undertaken to date has been of a highly preliminary nature, such as shovel testing while preparing trail routes.

Historic Quarries Within Apostle Islands National Lakeshore

Basswood Island: Bass Island Brown Stone Company Quarry

The opening of the Bass Island Brown Stone Company quarry resulted from the 1868 proposal for construction of a new Milwaukee county courthouse designed of stone. The ensuing publicity contributed to the growing popularity of sandstone construction. The 1871 Chicago fire, which resulted in more stringent fire codes mandating masonry buildings, drove the demand for stone even higher. The quarry operated, with several interruptions due to economic turmoil, until the early 1900s.

Today, the quarry is an irregular opening approximately 400 feet long, 300 feet wide, and 40 feet deep. The deepest section of the quarry has filled with water so the walls now visible to an observer are approximately 25 feet high. Excavation marks caused by removal of sandstone remain clearly evident. A few pieces of iron rod can be seen at the northeast end of the quarry, partially buried by leaf mold and other debris, but no other visible artifacts can be observed.

Basswood Island: Breckenridge Quarry

In 1872, former Vice President John Breckenridge announced plans to open a quarry on Basswood Island. Breckenridge, who ran unsuccessfully against Abraham Lincoln in the 1860 Presidential election, then served as Secretary of War for the Confederate States, was among a group of Kentucky natives investing in the endeavor. However, it was not until twenty years

later that Breckinridge's heirs actually began operations on the site. The endeavor met with only limited success, however, and never attained the scale of the neighboring Bass Island quarry.

The visible remains of the Breckinridge quarrying operation consist of two small excavations. The hiking trail passes along the upper edge of one excavation, but trees and brush make it difficult to make out details in the pit itself. Drilling marks are clearly visible to an observer standing in the pit itself. An iron pipe, possibly the remains of a boat mooring, can be seen sticking out of a rock ledge at the water's edge approximately midway between the two Breckinridge pits. No other surface artifacts are noticeable.

Hermit Island: Excelsior Brownstone Company

Frederick Prentice, the most prominent of Chequamegon brownstone entrepreneurs, established this island quarry in 1891. By summer, the operation site employed 100 men who lived in a village of cottages. For his own use, Prentice constructed an elaborate summer home that combined Queen Anne styling with a rustic veneer of cedar bark. Local legend avers that Prentice's much younger bride disliked the island location; whatever the reason, the mansion was quickly abandoned, left to decay, and finally demolished in the 1930s. The 1893 financial recession forced the Prentice Brownstone Company into receivership. The quarry continued to operate for another four years, but cut stone for the last time in 1897. Limited archeological work has been conducted at the site.

Stockton Island: Ashland Brown Stone Company

The Ashland Brown Stone Company quarry on Stockton Island first witnessed quarrying activity in 1871 when rubble stone was removed from the site for use in construction in Duluth. Illustrations and photographs from the time show an extensive quarrying operation, with several steam channelers operating simultaneously and multiple structures on site for machine shops, quarry offices, and worker housing. Production peaked in 1895 with 285,000 cubic feet of sandstone shipped. Quarry operations ceased in 1897.

The Ashland Brownstone Company quarry is the largest of the four quarries. Visitors following the hiking trail to the quarry find themselves standing at the edge of a 75-foot deep excavation, several acres in size. A number of metal artifacts, such as a length of heavy iron chain embedded in the ground, can be seen in the quarry's vicinity and serve to reinforce the site's identity as a former open pit mine.

3.2.8 Commercial Fishing

Fishing has long been an important component of Apostle Islands history. Native Americans in the Chequamegon Bay area relied heavily on lake trout and whitefish. By the 1840s the American Fur Company had commenced commercial fishing operations in the Apostles. By the end of the nineteenth century hundreds of commercial fishermen plied the waters of Lake Superior. Commercial fishing continued to be an important economic activity until the mid-

twentieth century when a combination of overfishing and depredations by the sea lamprey caused the lake trout population to crash.

Figure 3.2.8-1: "Governor's Cabin," Manitou Fish Camp

Apostle Islands Sites Related To Commercial Fishing

Manitou Island

The Manitou Fish Camp has been restored and preserved by the National Park Service. Located on the southwest corner of Manitou Island, 13 miles from Bayfield, the camp appears much as it did when it was operating during the 1930s and 40s. The camp's buildings- two log cabins and three frame sheds- were restored in 1983. Since 1984, Park staff has been stationed at the camp during most summers to provide tours of the site. Approximately 2,000 catalogued museum objects are displayed at the site: nets, tools, fish boxes, net markers, and a myriad of domestic furnishings. The clearing is small, and subject to vegetative encroachment; there is virtually no buffer between the wooden buildings and the surrounding forest.

Rocky Island

The Rocky Island fishing settlement, along the island's eastern shoreline, includes a complex of some 35 dwellings and other structures that are historically associated with a community seasonally occupied by Norwegian-American fishermen and their families.

Around 1888, Booth Fisheries established a fishing operation on the island. In 1895, a report called the island "…one of the most important fishing stations of the Booth Packing Company," and noted, "There is a dock and warehouse, while scattered along the sandy beach is a number of rustic huts, the homes of the fishermen." During the 1930s, a number of Norwegian-American

fishermen set up operation on Rocky Island. Many of these had previously fished from nearby South Twin, but after a dispute with that island's owner, moved their camps to Rocky, structures and all. As Rocky Island residents retired from commercial fishing in the 1940s and 50s, their families began to use their island properties for summer recreation. A small-scale resort and restaurant operated on the island from around 1946 to 1974.

The settlement has been proposed for designation as a National Register historic district, and the nomination is in preparation. One portion of the proposed district is already listed on the National Register, the Hadland brothers fishing camp at the northern extremity of the strip. This property is proposed to be incorporated into the larger district.

Mainland: Hokenson fishery

The Hokenson Fishery complex consists of eight buildings, a boat, and five structures on the southeast shore of Little Sand Bay on Lake Superior at the northern tip of Wisconsin's Bayfield Peninsula. The eight buildings are a herring shed, two privies, twine barn, ice house, one-and-a-half story residence, two-car garage, and a one room log cabin. The structures are an L-shaped dock, a pile driver, a net reel, and two box slides. Approximately 4,000 catalogued museum objects are displayed at the site.

Also included with the fisheries complex but discontiguous from it is the Nelson cabin, a one-room hired-man's cottage built in 1938, located approximately two-tenths of a mile to the southeast of the Hokenson house. The cabin reflects age-old Scandinavian craft traditions, with massive logs hand-hewn into precise, dovetailed corners.

Other Sites:

Considerable archeological investigation remains to be done: additional fish camps are known to have existed on Stockton Island (particularly in the Presque Isle area), on Outer Island (notably at the sand spit), on Oak, Cat, Ironwood, South Twin, Gull, Devils, Michigan, Long, and Bear Islands.

Figure 3.2.8-2: Fishing Boat Remains, Rocky Island

3.3 SOCIOECONOMICS

The majority of the 21 Apostle Islands are located in Ashland County. The mainland unit, and Eagle, Raspberry, Sand, and York Islands are located in Bayfield County, and the headquarters are located in the city of Bayfield.

The majority of Ashland County residents live in the city of Ashland. Bayfield County has seen steady growth since 1970 when the population was at 11,683, through 1990 (14,008 people), to 2000 with 15,013 people. The largest Bayfield County municipalities are the city of Washburn (2,280), and the towns of Iron River (1,059) or Russell (1,216).

Table 3.3.1 Socioeconomic data (2000) for Ashland and Bayfield Counties from U.S. Census and Wisconsin Department of Development datasets.

	Ashland County	Bayfield County
Population Total (#)	16,866	15,013
Race (Percent in each group)		
White	87.1	88.5
American Indian/Alaska Native	10.3	9.4
Age (Percent in each group)		
0-14	20.5	19.8
15-24	16.0	10.2
25-34	10.9	9.3
35-44	14.9	15.8
45-54	12.9	16.3
55-64	8.8	12.1
65+	16	16.4
Employment Sectors (Percent in each group)		
Education/Health Services	20	7
Government	23	33
Leisure & Hospitality	11	25
Manufacturing	14	4
Retail/Wholesale Trade	12	11
Percent Unemployed	9.0	7.1
Average Annual Wage ($)	25,240	19,836

American Indian/Alaska Natives comprise the largest minority group for both Ashland and Bayfield counties with the majority of the population white. Currently, the largest amount of people in the Ashland County population fall into the 0-14 year old age group, and almost 16% are between 15-25 years old. Over the next 15 years the number of people between the ages of 25 and 39, and between 55 and 74 is predicted to increase. In Bayfield County, the largest percentage falls into the 45-54 year old group followed closely by the group of people reporting their age between 35-44 years. Bayfield County is expected to see an increase in the number of people over the age of 55 during the same 15 year timeframe.

When comparing employment information between the two counties, Ashland has a higher annual wage but also a higher percentage of the population is unemployed. Major employment sectors are government, and education and health services for Ashland County and government, and leisure and hospitality for Bayfield County.

Ashland County covers 1,044 square miles with 157 lakes totaling 5,936 acres. Bayfield County covers 1,476 square miles with 962 lakes totaling 22,629 acres. The natural beauty of the area and the 21 islands in the Apostle's archipelago, combined with several historic sites including 6 light stations, brownstone architecture and quarry sites, and several historic fishery sites make the area and the Park popular destinations for tourists. Other agencies that bring tourism to the two county area include the U. S. Fish and Wildlife Service Whittlesey Creek National Wildlife Refuge, U. S. Forest Service Chequamegon National Forest, and state Parks.

Apostle Islands National Lakeshore and the surrounding area are within a days' travel (500 miles or less) from several major urban centers such as Chicago and Rockford, Illinois; Dubuque, Iowa; Duluth and Minneapolis/St. Paul, Minnesota; and Eau Claire, Madison, Milwaukee, and Wausau, Wisconsin. Tourism is important in the area as a result of the Parks location in such a uniquely beautiful area that is easily accessible to numerous people.

Outdoor recreation activities such as boating, canoeing, sailing, and sea kayaking are popular and often done in conjunction with birding, biking, camping, fishing, hiking, or hunting. Winter activities include skiing, snowmobiling, or visiting the ice caves that are part of Apostle Islands National Lakeshore located between Bayfield and Cornucopia. When ice conditions are favorable, thousands of visitors come to walk to and experience the caves.

Yearly worldwide events such as the American Birkebeiner bring in thousands of people to the Northwoods area. National and regional include events such as Apple Festival, Bay Days, Birding on the Bay, Blessing of the Fleet, Brownstone Festival, Chequamegon Bay Rendezvous, Chequamegon Fat Tire Festival, Pedal, Paddle and Run Triathlon, Walk on Water, and area Pow Wows also promote tourism of the area.

Other attractions in the area include dining, shopping, museums, theatre, and casinos available in several locations throughout the two county area.

The economic impact of tourism on these two counties is significant (see Table 3.3.2). Economic impact begins when a visitor to an area spends any amount of money on any product or service in that area. The impact can be direct such as revenues from rentals or purchases, or more indirect such as jobs created in the construction industry as more lodging is built and shops are renovated.

The communities of Ashland, Bayfield, Washburn, Red Cliff, Bad River, Cornucopia, Herbster and Port Wing owe much of their annual income to tourism. Bayfield is primarily driven economically by tourism and has seen a 97% increase in dollars related to tourism since 1993.

Table 3.3.2 Tourism Spending in Ashland and Bayfield Counties in 2003 from U.S. Census and Wisconsin Department of Development datasets..

	Ashland	**Bayfield**
State Rank for Tourism Spending	45th	27th
Tourism Spending in 2003	66 million	117 million
Tourism Supported Wages	40 million	40 million
Seasonal Breakdown of Tourism Expenditures (Percent)		
Spring	18	17
Summer	43	39
Fall	25	28
Winter	14	16

Private services relating to tourism outside of the Park boundary includes 44 Incidental Business Permitees offering boat adventures, kayak trips, fishing charters, water taxi services, sailing

adventures, diving, dog sledding and equipment rental. The Park has one licensed concessionaire who offers cruise services to specific island locations.

The average tourist party size is 3 people and vacations typically last from 2-4 days with 54% indicating that they do not plan to travel outside of the area they are vacationing. Daytrips comprise 35% of those in the area with overnight visitors comprising 65 percent. Overnight visitors spend an average of $491 per visit. Over 90% of visitors indicate that they will return to Wisconsin for another vacation in the next several years.

In addition, Apostle Islands National Lakeshore's enabling legislation allowed owners of improved property within the Park to retain use and occupancy rights for non-commercial residential purposes for a period not to exceed 25 years or life following NPS acquisition. Approximately 12 such use and occupancies exist within the Park, a number of that is gradually declining.

3.4 HUMAN HEALTH AND SAFETY

The saving of human life will take precedence over all other management actions as the agency strives to protect human life and provide for injury-free visits (2001 National Park Service Management Polices). The Park Service will work cooperatively with other Federal, tribal, state, and local agencies, organizations and individuals to carry out this responsibility.

Although the Park is mandated to be the primary emergency service provider within the Park boundary, local governments also provide public safety services to Park visitors and serve the adjacent communities. These public safety services include structural and wildland firefighting, law enforcement, search and rescue, and emergency medical management services. Presently the Park has only two approved emergency service general agreements. One of these agreements is a General Agreement with the U. S. Forest Service, Chequamegon National Forest. This agreement is established for mutual Wildland Fire Management Cooperation concerns. The second approved agreement is with the Bayfield Community Ambulance Service. This agreement is established for requesting assistance with patient care and transporting of sick and injured to nearby hospitals. It also allows for the sharing of resources in performing joint operations in time of emergencies. The Park is presently working on updating and or initiating agreements with the Wisconsin Department of Natural Resources, Ashland and Bayfield County Sheriff's Departments, Red Cliff Band of Superior Chippewa VFD and EMS, Bayfield Volunteer Fire Department, Bayfield Township EMS, and the Township of La Pointe.

The Apostle Islands NL is located in both Bayfield and Ashland Counties. The Mainland Unit is located in Russell and Bayfield Townships. A large portion of the mainland unit is found within the boundary of the Red Cliff Indian Reservation. Each of these areas is served by their own public safety entities. The 21 islands found within the Park are located in La Pointe, Russell and Bayfield Townships. Each of these political entities serve a large geographic area, have limited financial resources, minimal equipment, and limited trained personnel. Personnel from the Bayfield Station of the U. S. Coast Guard provide emergency response to boaters found on all

navigational waters adjacent to the islands and mainland unit. Serving the Park's mainland unit and the islands becomes a logistical problem for each of these public safety entities.

To provide for the protection and safety of Park visitors, the Park will make reasonable efforts to search for lost persons, and to rescue the sick and injured, or stranded persons. This responsibility will be fulfilled by designated NPS employees, and/or by qualified search and rescue organizations and or agencies that are capable of responding to life-threatening emergencies pursuant to terms of agreements and/or legislated laws. All emergency actions will be conducted utilizing the Incident Command System (ICS) of the National Incident Management System. The Unified Command System, a component of the ICS that is a preferred method for all agencies and or individuals who have jurisdictional responsibilities and or functional responsibilities, will be utilized whenever other agencies are involved with an incident. In order that a safe and effective course of action is followed Park staff will adopt the procedures found in the annually updated "Apostle Islands NL Park Emergency Operations Plan".

Law enforcement duties are performed by designated National Park Service commissioned officers serving the Park. The NPS has concurrent jurisdiction on all Federally owned lands and waters within the legislated boundary of the Apostle Islands National Lakeshore. Under concurrent jurisdiction, the state retains its authority to investigate and prosecute any persons charged with the commission of any State offence. These offenses include all state laws and regulations and are enforceable by designated state and county police officers. Ashland and Bayfield Sheriff's Departments are the primary law enforcement agencies serving the Park. The Red Cliff Tribal Police and Wardens have responsibilities within the boundary of the Red Cliff Indian Reservation.

Smoke, heat and flames from forest fires can threaten human lives and health, both of the public and fire fighters in particular. A number of considerations have a bearing on protection of human health and safety including the following:

- Logistics to 21 islands and a mainland unit.
- Uncontrolled access at numerous places.
- Numerous day-use visitors. No permit is required so there is no way to know where visitors are located.
- Use and occupancy sites on Rocky, Sand and Bear Islands.
- Several islands have resident volunteers and/or staff.
- There are numerous miles of trails that cross the islands and mainland. Portions of these trails are in remote locations in island centers.

Apostle Islands NL provides information regarding safety issues in a variety of ways prior to the time that visitors arrive and during their stay at the Park. Information is available during pre-visit contacts, news releases, and on the Parks internet website. Visitors also receive information when they arrive at the headquarters visitor center, and obtain permits for various activities. Upon arrival to the islands further information is available on bulletin boards at numerous access points throughout the Park. Resident volunteers are stationed on the most popular islands, and Park rangers frequent high use visitation sites throughout the busiest summer season. The Park

also has the capacity to contact the U.S. Coast Guard via marine radio and request that information be broadcast to boaters in the vicinity.

The Park has created numerous safety plans that address search and rescue, emergency medical services, natural disasters, and structural and wildland fires. Any time human life is endangered, all necessary means will be taken to warn or evacuate visitors, and private and retained use and occupancy cabin users. Visitor use will be limited or prevented near wildland fires and potentially affected areas. Park Service personnel will patrol the perimeter of fires burning in the Park to inform visitors and neighbors about the role of fire in a natural area, explain the risks associated with approaching too close to a fire, and enforce visitor compliance with area closure orders.

3.5 VISITOR USE AND EXPERIENCE

Visitation in the Park has increased from 140,980 in 1990 to more than 187,700 in 2002. Approximately 72% of annual visitation occurs in June-August (Apostle Islands National Lakeshore Camping Policy Assessment Summer 2001).

The Mainland Unit of the Park can be reached by county roads but most visitors come to experience the islands and Lake Superior. Little Sand Bay is the most frequently used area in the Mainland Unit. It has a beach, boat launch, kayak launch, picnic area, and a visitor center that serves 7500-11,000 visitors during the summer. Visitors reach the islands by a variety of water craft including concession-operated cruise boats, private power boats, sailboats, canoes, and kayaks. Kayak use at Apostle Islands National Lakeshore has increased rapidly since the late 1980s and they are now the main mode of transportation used by visitors to reach campsites in the National Lakeshore. Boaters are allowed to moor overnight at public docks on 13 islands and at Little Sand Bay on the Mainland Unit.

There are 65 designated campsites in the national lakeshore and zones have been established on 16 islands where camping is allowed outside designated sites. A computerized Backcountry Permit System was developed and implemented in 1997. More than 1,500 group and individual camping permits have been issued annually since 1998. In 1999, 67% of campers stayed in individual sites, 30% stayed in group sites and 3% camped in undesignated wilderness camping areas. In 2000, 54% of people were in individual sites, 43% in group sites, and 3% in undesignated wilderness sites. In 2003 and 2004, approximately 88% of permits were in individual sites; with the remaining amount in group sites (this does not include the number in undesignated wilderness sites).

Stockton Island receives the highest amount of camping use (>4,500 campers/year). It has 21 individual sites and three group sites. A small amphitheater and a visitor center with an information desk, exhibits, and sales items are located near Stockton Island's Presque Isle campground. Nightly campfire programs serve 1000-1400 visitors from late June to Labor Day. With the exception of Stockton, the islands closest to the mainland receive the highest overnight visitation. These islands include Basswood (>1,400 campers/year), Oak (>2,950 campers/year), and Sand (>2600 campers/year). Islands furthest from the mainland such as Devils, Michigan, and Outer have fewer campsites and receive fewer visitors. All designated sites and the majority

of sites used by backcountry campers are located near the shoreline. Very little camping is done in the island interiors. The average camper stay is 2.7 days. Well developed trail systems are present on Basswood, Oak, Outer, Sand, and Stockton Islands. Minor trail systems exist on Devils, Manitou, Michigan Otter, Raspberry, and Rocky Islands. As of 2004, the Park Trail runs 4.5 miles along the Mainland Unit from Meyers Beach past the mainland sea caves to a designated campsite southwest of Sand Point.

Cruise boats provide daily island shuttles to Stockton, Oak, Raspberry, and sometimes Manitou and Sand islands from mid-June to September. Day use visitors can use these shuttles to spend from 30 minutes to three hours on these islands. Shuttle passengers hike, picnic, and take interpretive tours during their stay on the islands. Between 2,500 and 4,500 cruise passengers tour the Raspberry Island lighthouse annually.

Park staff offer guided tours to visitors arriving in private boats at several lighthouses and the Manitou Island Fish Camp. From 3,000 to 6,000 visitors arriving at Raspberry Island via sailboat, power boat, or sea kayak tour the lighthouse each summer. Sand Island light is toured by 2,000 to 2,500 visitors annually. The light stations at Devils and Michigan islands receive 1,000 to 1,500 visitors each. From 1,200 to 1,500 visitors tour the historic commercial fishing camp at Manitou Island.

Chapter 4
ENVIRONMENTAL IMPACTS

This chapter provides an analysis of the potential environmental effects of implementing any of the alternatives described in Chapter Two. Each resource area described in Chapter 3 is addressed here.

In each resource area, the impacts of the No Action alternative (Alternative A, continuation of current practices) are first discussed. Each of the other two alternatives, including the Preferred Alternative, is then compared to the No Action alternative.

Wildland fire use would not be used on the Mainland Unit, or in Fire Exclusion Zones. Therefore effects of wildland fire use will be discussed relative to those portions where it is considered.

Investigation and analyses were completed by gathering data regarding sensitivity of the various resource areas. Using this information, likely impacts from fire suppression tactics, the lack of wildfires, or wildland fire use, and prescribed fires were identified and then assessed according to their duration, extent, intensity, and whether or not the impact would cause an Impairment Determination (NPS Directors Order 12) of Apostle Islands National Lakeshore's resources. These parameters are defined for each resource.

Remote islands in Lake Superior present both opportunities and challenges when it comes to wildland fire use. Most islands are owned by the federal government in their entirety, and are surrounded by a mile or more of water, sharply reducing the odds that a fire will escape onto non-federal lands. While this is a benefit when it comes to wildland fire use, it also means that logistics are far more complicated than logistics elsewhere. If a fire were to start within the interior of some islands, long hours would pass before firefighters could arrive, and the equipment they would arrive with would be minimal. Under severe enough conditions, the fire simply couldn't be safely or effectively fought. The National Park Service will always seek to protect resources within exclusion zones, but it must be acknowledged that under certain circumstances, island logistics will hamper those efforts.

There are a variety of suppression tactics available for use. Their likelihood of use, however, varies widely and is dependent upon availability, logistics, and need. Fire suppression can rely on aerial attack using both helicopters and fixed-wing craft, both of which could require a landing area. These craft are used either to drop incendiary devices for burn-out operations or to drop retardants or water for suppression purposes. In addition to landing zones, base camps could be required. Heavy equipment such as bulldozers and pumper trucks, are frequently used in suppression and the mop-up phase. At times fire lines may be constructed using explosives that quickly clear vegetation in a linear manner to stop fire spread. Fire lines may also be created using hand crews that remove all vegetation with hand tools, or by wet line techniques which depend upon the application of water or foam. The width of the fire line will vary depending upon the fuels in the area and the intensity, size, and rate of spread of an approaching fire. Hoses

and sprinkler systems are both frequently used. One technique, referred to as hydro-mining, involves hosing an area with water under pressure for a length of time. This may be utilized when fires are deep within stumps or are underground.

In a suppression operation, any of the techniques described are possibilities. However, the NPS is mandated by Directors Order 18 to use Minimum Impact Suppression Tactics which attempts to reduce impacts of controlling or suppressing fires. The wilderness designation requires that lands be managed in a manner that will not adversely impact wilderness values. In addition, the island nature of the Park makes some tactics more likely than others due to logistics. These considerations make construction of fire lines with hand crews more likely than with heavy equipment.

Prescribed fire operations are pre-planned and therefore rely more often on fire line construction with hand crews, or wet lines. Other tactics more likely to be used are foam and sprinkler systems.

4.1 NATURAL RESOURCES

4.1.1 Air Quality

Impacts to air quality were qualitatively assessed by means of a review of the literature and pertinent laws, guidance and regulations, professional judgment, and experience with comparable actions.

Intensity

Negligible - No changes would occur or changes in air quality would be below or at the level of detection, and if detected, would have effects that would be considered slight and short-term.

Minor - Changes in air quality would be measurable, although the changes would be short-term, small, and the effects would be localized. No air quality mitigation measures would be necessary.

Moderate - Changes in air quality would be measurable, would have consequences, although the effect would be relatively local. Air quality mitigation measures would be necessary and the measures would likely be successful.

Major - Changes in air quality would be measurable, would have substantial consequences, and be noticed regionally. Air quality mitigation measures would be necessary and the success of the measures could not be guaranteed.

Duration

Short-Term - Recovers in 7 days or less.

Long-Term - Takes more than 7 days to recover.

Extent

Localized – Impacts would affect air quality only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect air quality throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect air quality on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

General Effects

Wildland fires produce various chemical compounds including nitrogen oxides (NOx), organic compounds, carbon monoxide, and particulate matter (PM) or small particles. The pollutants released by fires that most affect visibility are PM_{10}, $PM_{2.5}$ (particulate matter 10 and 2.5 microns in diameter, respectively), nitrates, ozone, organic carbon, and elemental carbon. Ozone, a corrosive constituent of "smog" or haze, is not directly produced by fires, but from chemical reactions between other combustion products (NOx and volatile organic compounds or VOCs). About 90 percent of smoke particles from wildland and prescribed fires are PM_{10} or less. Of that amount about 20 percent are between PM_{10} and $PM_{2.5}$, and 70 percent are $PM_{2.5}$ or smaller (EPA 1998).

Wildland fires also release gaseous elemental mercury to the atmosphere, where it typically stays airborne and circulates around the planet for about a year before being deposited on the land, water or vegetation (NCAR 2001). Recent research has shown that samples of coniferous and deciduous foliage and litter released nearly all the mercury they contained, which ranged from 14 to 71 nanograms per gram of fuel (a nanogram is one trillionth of a gram; about 28 grams make an ounce). The implications of these findings for evaluating the effects of wildland and prescribed fires on air and water quality, wildlife, and fisheries in the Park are not immediately clear. However, it would appear that, due to the dynamic behavior and residence time of the gaseous elemental mercury in the atmosphere, contributions from fires within the Park per se are less of a concern than overall cumulative human emissions of mercury to the atmosphere.

Another toxic pollutant released in trace amounts by forest fires into the air is dioxin (Gossman Consulting no date), a family of chemical compounds that scientific studies have shown can cause a number of adverse health effects (USDA FSIS 1999). Among other things, dioxins are known endocrine disrupters (EMS 2001); in humans, heart disease, cancer, and increased risk of diabetes have also been linked to dioxin (NIEHS 2001). Dioxins deposited in the environment can be taken up by plants and then animals and aquatic organisms, growing more concentrated as they ascend the food chain (a phenomenon known as "biomagnification") so that animals, especially carnivores, have higher concentrations than herbivores, plants, water, soil, or sediments. Within animals, dioxins tend to accumulate in fat. Food accounts for 95 percent of human exposure to dioxin (TRI no date). However, levels of dioxin in food have been cut in half in recent years as a result of growing awareness and regulation.

The presence of dioxins and other synthetic organic chemicals and heavy metals released by human activity near and far into the Park environment is a source of concern. However, at present, there is no research that would indicate that dioxin concentrations in the Apostle Islands environment are high enough to be having a detrimental effect on wildlife populations. For example, the bald eagle, a raptor at the top of the food chain (and therefore most susceptible to bioaccumulation), has been increasing in the Park over the past decade; loons and ospreys appear to be holding their own.

Chequamegon National Forest to the south has both a wildland fire use program and a prescribed firing program. Apostle Islands would coordinate with the Forest Service on scheduling of prescribed fires to ensure that excessive smoke impacts do not occur to the air shed. In addition, the Park would try to minimize smoke in smoke-sensitive areas.

Park fire managers would make every attempt to mitigate the negative impacts of smoke by following the procedures in the Best Available Control Measures as described by the U.S. Environmental Protection Agency. In addition, the following strategies will be used when feasible:

- Reduce fuels available for combustion by removal, use head-fire ignition with the wind wherever practical;
- Burn at higher fuel moisture of the large (1,000 hr time lag and above) fuels: A 1% increase in 1,000-hr fuel moisture can result in a 3% decrease in particulate emissions. Combine this technique with burning at lower fine fuel moisture;
- Reduce particulate emissions for the fuel consumed by reducing the time period of the smoldering phase; encourage flaming combustion to the extent possible;
- Avoid smoke-sensitive areas, such as highways during heavy traffic periods (i.e., weekends, holidays);
- Avoid burning near smoke sensitive areas when there are strong inversions or very stable high pressure systems are in place;
- The ventilation index will be good or better for adequate smoke dispersion. The National Weather Service in Duluth produces a daily smoke management forecast with their fire weather forecasts during the fire season. These can be found at: http://www.crh.noaa.gov/dlh/firewx.htm

Alternative A

Analysis – This alternative would continue current management practices of suppressing all human and lightning-caused fires, not using wildland fire use, or completing any prescribed fires.

Minimal amounts of smoke would be produced under this alternative due to the complete suppression of all fires. However, there would be a negligible amount of emissions from heavy equipment associated with suppression activities. By suppressing all wildland fires over a period of decades, which was the policy of the NPS and other Federal agencies during most of the 20th century, some Park lands would accumulate fuels over time. Eventually, under extreme weather conditions that could occur sooner or later, a destructive, less controllable wildfire could consume these fuels. Under that scenario, a larger air pollution episode would occur that could last days or weeks, with potential violations of the National Ambient Air Quality Standards (NAAQS).

Conclusion - Since large, severe fires may occasionally occur under this alternative on a time frame ranging from multiple decades to centuries, Alternative A could result in temporary, adverse, moderate impacts on regional air quality at these times.

Impairment Determination - The implementation of Alternative A would not significantly impair air resources and related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural

integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – Proposed actions under Alternative B include suppressing all human-caused fires, using wildland fire use on approximately 38,100 acres, and completing no prescribed fires. Effects of suppression would result in a minimal amount of smoke production on an annual basis. There would be a potential to produce larger amounts on an infrequent basis as a result of fuel accumulation over time resulting in rare but more intense fires.

Wildland fire use would not be utilized on the Mainland Unit. Subsequently the largest fire managed under wildland fire use that can occur within the Park equals the largest island in size, which is Stockton Island at 10,054 acres. This factor alone would limit the amount of smoke produced as a result of any fire managed under wildland fire use protocols. The likelihood of a fire covering the entire island is small.

This alternative would be more likely to lead to more concentrated emissions at particular times when weather conditions were conducive to naturally-ignited wildland fires.

Conclusion – Effects of implementing this alternative would be negligible to moderate, adverse, and would range between short and long-term, and localized to regional. This is because lightning-caused fires would be managed when they occurred which would have the effect of reducing fuels on a more regular basis. Over the long-term, this would reduce the likelihood of infrequent, more intense fires that have the potential to produce larger quantities of smoke over longer periods of time.

Impairment Determination - The implementation of Alternative B would not significantly impair air resources and related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – Under Alternative C, all human-caused fires would be suppressed, wildland fire use would be utilized on approximately 38,100 acres, and prescribed fires would be permissible on approximately 38,100 acres, with 600 acres specifically identified at the present time. Effects of suppression would be the same as those under Alternative A, and would be minimal in most years but moderate during an infrequent, but more intense fire. The effects of wildland fire use would be the same as those under Alternative B. Fires would be limited in size due to the island nature of the Park, which would limit the amount of smoke produced. There would be more concentrated emissions at times when weather conditions were conducive to lightning-caused fires.

Effects are expected to be minor from prescribed fires. This is due to the small amount of acreage proposed for prescribed fires both cumulatively and at any one time, as well the manner

in which they are completed, which is to minimize impacts, including smoke production. In addition, prescribed fires would occur infrequently.

Conclusion –The effects of this alternative would be negligible to moderate, adverse, and between short and long-term, and localized to regional. Effects of prescribed fires would be negligible to minor and short-term due to the small amount proposed in this EA and during any given year.

Impairment Determination - The implementation of this alternative would not significantly impair air resources and related values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

General Conclusions

Individual fires, whether prescribed fires, wildland fires for resource benefits, or wildfires, depending on their size and severity, would generate impacts on air quality that range from temporary to short-term, localized to regional, and minor to major (but very infrequent).

Alternative B, which emphasizes wildland fire use and de-emphasizes prescribed fire, would in most years produce no to low amounts of smoke due to a lack of fires, but once or more every few decades or so would produce much greater emissions when large fires consumed accumulated fuel. These impacts could be short-term, regional and moderate to major in intensity. Likewise, Alternative A, which suppresses all fires, would in most years have even fewer emissions. However, as fuels accumulate, extreme weather conditions could infrequently trigger large fires with a potential for short-term major impacts on regional air quality for up to a few weeks at a time.

The implementation of Alternatives B or C would not significantly impair air resources and related values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

In contrast, during most years, Alternative A, because of its lack of prescribed fire and wildland fire use, would actually produce less smoke and thus better air quality and visibility than any of the other alternatives. The tradeoff, however, is the full suppression alternative could result in large fires that challenge suppression efforts and generate larger impacts on air quality and significant air pollution episodes.

Cumulative Impacts

Most sources of pollutants are outside the Park, both nearby as with a power plant in Ashland, and much further away, as in the case of the Duluth-Superior industrial Park. It is unknown whether these sources would continue to function in the future.

Since an increase in Apostle Islands National Lakeshore's total emissions from some combination of prescribed fires, wildland fire use, and wildfires in the coming decades is more likely under alternatives B & C (mostly as a result of having to contend with fuels that have accumulated over many decades of fire suppression), the Park would contribute incrementally to overall cumulative impacts to the regional airshed that could be rated as minor to moderate.

4.1.2 Water Quality

Methodology/Basis of Analysis

Potential impacts were qualitatively assessed to water resources by means of reviewing literature and applying professional judgment and experience with water resources (quality and quantity) to the particular hydrologic conditions of Apostle Islands National Lakeshore. It is not believed that implementation of any of the alternatives would impact Lake Superior waters. This effects section will focus on waters in wetlands, streams, and rivers within the Park's boundary

Intensity

Negligible - Chemical or physical changes to water quality would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor - Chemical or physical changes to water quality would be detectable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate - Chemical or physical changes to water quality would be detectable but would be at or below water quality standards or criteria. Water quality would be altered on a short-term basis compared to historical baseline or desired water quality conditions.

Major - Chemical or physical changes to water quality would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be locally, slightly, and singularly exceeded on a short-term and temporary basis.

Duration

Short-Term - Recovers in less than 1 year.

Long-Term - Takes more than 1 year to recover.

Extent

Localized – Impacts would affect water quality only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect water quality throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect water quality on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

General Effects

The two principal impacts to water quality stem from: 1) erosion-induced suspended sediments, turbidity, and sedimentation, and 2) toxic effects from fire retardants and foam suppressants. In addition, intense fires may introduce quantities of organic material (ash) into aquatic systems, blown in by wind or transported by runoff.

Increased soil erosion can result from loss of vegetative cover during a fire as well as from ground crews engaged in suppression activities. These could lead to turbidity and sedimentation of surface water resources in the Park, both in streams and wetlands. Turbidity and sedimentation can alter the hydrologic regime of surface waters and adversely impact aquatic habitats, invertebrates, and fish. Diligent adherence to Minimum Impact Suppression Techniques would reduce water quality problems from suppression efforts.

The use of fire retardants and/or foams could potentially cause significant temporary to short-term impacts to water quality and aquatic life if misapplied or mishandled (USDA Forest Service 2000a). Retardants contain ammonia and phosphate or sulfate ions, which can change the chemistry of a water body, thus making it temporarily lethal to fish and other aquatic organisms; the principal toxic component of retardant chemicals in aquatic systems is ammonia (Adams and Simmons 1999). Foams contain detergents that can interfere with the ability of fish gills to absorb oxygen. The degree of impact would depend on the volume of retardant/foam dropped into a water body, the size of the water body, and the volume of flow in the stream or river. For example, if an 800-gallon drop is made into a fast flowing river, it is likely that the lethal effects to aquatic resources would be short-lived as dilution below the toxic level is quickly achieved. On the other hand, a 3,000-gallon drop in a stagnant pond would likely cause toxic levels to persist for some time (USDA Forest Service 2001).

After an extensive review of the literature, the Environmental Protection Agency (EPA) published a regulation (40 CFR Ch. 1, 122.27 – 122.3) that deemed the use of retardants and foam suppressants in firefighting as a Cataclysmic Release. This ruling views their use as necessary in order to prevent the greater destruction of aquatic ecosystems from fire-caused silting, suspended solids, and pH changes, rather than focusing on the possible loss of fish from an inadvertent retardant drop into a water body (USDA Forest Service 2000a). The EPA Office of the General Council reviewed this ruling and concurred that fire retardants and foams are neither subject to Point Source Regulations nor the National Pollution Discharge Elimination System (NPDES) procedures under the Federal Clean Water Act. Nevertheless, scientific studies state unequivocally that direct application of fire retardant to waterways should be avoided.

Diligent adherence to mitigation measures would reduce the chance of adverse effects on water quality from the use of chemicals to suppress fires. However, there always exists the possibility of an accidental spill or aerial delivery of fire retardant, foam suppressant, or other hazardous material such as gasoline, directly into water bodies.

Another short-term impact of fires, particularly severe ones, on water quantity as well as quality is likely to be increasing the peak of the hydrograph within a given fire-impacted watershed until

vegetative cover is able to re-establish itself. That is, the pulse of water flow through the hydrologic system would increase, as a result of decreased infiltration and absorption of rainfall into duff, litter and soil. Therefore, the runoff rate increases. This greater volume and velocity of flowing waters could potentially cause some scouring in streams and a temporary to short-term increase in turbidity and sedimentation.

Alternative A

Analysis – Since all wildland fires would be suppressed and no prescribed fires would be undertaken, there would be less impact to water quality from loss of vegetation cover and subsequent erosion, runoff, and turbidity. However, greater quantities of fire retardants and suppressants would be used in this alternative, especially during rare large wildfire suppression efforts, increasing the risk of temporary toxic impacts to water quality and aquatic life.

Conclusion – Over the short-term effects of this alternative would be negligible to minor, adverse, short-term, and localized. A large, intense fire – which has a small, but non-zero possibility of occurring under this alternative – has a higher probability of resulting in short-term, localized, and minor to moderate, localized to local adverse impacts on water quality from erosion, turbidity and sedimentation.

Impairment Determination - The implementation of this alternative would not significantly impair water resources or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – The effects of suppressing human-caused fires would be more closely associated with Visitor Use Areas (VUA), where these types of fires usually occur. Suppression efforts would require use of retardants and suppressants. The potential for effects to water quality and aquatic life would likely be minimal because there are few aquatic resources in close proximity to VUA's.

Management of wildland fire use would likely require less use of suppressants or foam. More vegetation would likely be removed which could result in a higher risk of erosion, sedimentation, and turbidity. However, erosion is typically associated with more significant topography than what is found in the Park. In addition, there are not a lot of rivers or wetlands in the Park which reduces the probability of sedimentation and turbidity occurring within water bodies.

Conclusion – Effects would be negligible to minor, adverse, short-term to long-term, and localized. This is because implementation of wildland fire use would reduce the likelihood of rare but intense fires that have the potential to cause greater impacts.

Impairment Determination - The implementation of this alternative would not significantly impair water resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural

integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – This alternative would suppress all human-caused fires, manage lightning-caused fires, and add prescribed fire to the range of options. Suppressing human-caused fires would result in greater quantities of suppressants and retardants but less likelihood of impacts to water quality from loss of vegetative cover and some associated erosion, runoff, and turbidity. Potential toxicity effects would likely occur in and around Visitor Use Ares, where most human-caused fires occur. However, these effects should be minimal due to the relatively flat nature of the Park.

The overall effects of implementing wildland fire use would be similar to Alternative B. Vegetation could be removed which can expose and destabilize soils and result in erosion, and sedimentation, and turbidity in streams. However, retardants and foam would be required less often. Any effects of implementing prescribed fire would be similar, but less intense, than those outlined for wildland fire use.

Conclusion – Effects of suppressing human-caused fires would be negligible to minor, adverse, short-term, and localized. Effects of wildland fire use would be negligible to minor, adverse, short- to long-term, and localized to local. Effects of prescribed fire would be negligible, short-term, and localized due to the small amount likely to be burned in any given year.

Impairment Determination - The implementation of this alternative would not significantly impair water resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

General Conclusions

Each of the alternatives discussed above would have some impacts on the Parks water resources, more so on water quality than water quantity (hydrology and flow patterns). Both fires and suppression actions would potentially affect water quality, the former from erosion and turbidity due to loss of vegetative cover and soil disturbance, the latter from possible temporary to short-term toxic effects of firefighting chemicals (retardants and foams) if dropped inadvertently into streams or lakes.

These impacts would range from negligible to moderate in intensity; in the case of any given fire or suppression action, they would tend to be short-term and localized. The impact of any given prescribed fire is likely to be temporary to short-term, localized and negligible to minor. Larger wildland fires or wildfires can both affect more surface waters and affect them more negatively.

By attempting to suppress all fires, Alternative A would avoid relatively small year-to-year effects on water quality from prescribed fires and wildland fire use, but at the cost of rare but more intense fires that would have a much more severe, potentially regional, and longer-lasting

impact on water quality, aquatic habitat, and aquatic organisms from erosion, turbidity and sedimentation.

Cumulative Impacts – Overall, water quality in the Park is good. Water quality in rivers, streams, and wetlands in the Mainland Unit are much more likely to be effected by deleterious influences over time than are similar waters on the islands. The three alternatives proposed in this EA are not likely to contribute to significantly adverse cumulative impacts on the Park's water quality.

4.1.3 Geology and Soils

Methodology/Basis of Analysis

Potential impacts to geology and soil resources were qualitatively assessed using literature review, professional judgment, and experience with comparable actions. Geological features were assessed based upon potential impacts to their physical structure. Soils were evaluated based upon productivity and fertility as well as the potential for an action to cause heat, erosion, and compaction effects to this resource.

Intensity

Negligible – The physical structure of geological resources would not be affected or the change would be so small that it would not be of any measurable or perceptible consequence. Soils would not be affected, or the effects to soils would be below or at the lower levels of detection. Any effects to soil productivity or fertility would be slight, and no long-term effects to soils would occur.

Minor – Changes to geological features would be detectable, but small, localized, and of little consequence. The effects to soils would be detectable. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.

Moderate – Change would occur to geological resources which would be measurable and of consequence. The effects on soil productivity or fertility would be readily apparent, likely long-term, and result in a change to the soil character over a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Major – A noticeable change to geological resources would occur; the change would be measurable and result in a severely adverse impact. The effect on soil productivity or fertility would be readily apparent, long-term, and substantially change the character of the soils over a large area in and out of the Park. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

Duration

Short-Term – Geological and Soils Resources: Recovers in less than 3 years.

Long-Term – Geological and Soils Resources: Takes more than 3 years to recover.

Extent

Localized – Impacts would affect geological or soil resources only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect geological or soil resources throughout the Park, but would not extend into the region outside.
Regional – Impacts would affect geological or soil resources on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A
Analysis – Under Alternative A, or the No Action Alternative, all wildland fires would be suppressed regardless of origin, and prescribed fire would not be implemented anywhere in the Park. Subsequently, the only portion of this alternative that would have the potential for effects on geology and soils are those activities associated with wildfire and their suppression.

Suppression activities could potentially include the use of heavy equipment such as a bulldozer to create fire lines. Heavy equipment has the potential to cause structural damage to rock shelves during offloading or normal operations if driven on fragile rock surfaces such as those found at Devils Island. In addition, sandscapes could be negatively impacted if heavy equipment operation resulted in a loss of stabilizing vegetation. However, heavy equipment use is not the preferred choice due to wilderness concerns and the practicality in an island setting. This type of impact may be restricted to the Mainland Unit.

Suppression activities also have the potential to impact soil resources. Heavy equipment can compact soils which alters the movement of air and water move through the profile. This in turn can affect movement and uptake of nutrients and water by vegetation and can increase runoff. Other suppression tactics such as fire line construction result in the displacement of soils in the upper layers to expose the generally non- flammable mineral soil layer. This can be completed by hand crews or by using a bulldozer. Park Service policy requires the use of Minimum Impact Suppression Tactics to reduce the area of directly-disturbed ground surface.

Fire retardants and foam suppressants include fertilizers as an ingredient. Subsequently, their application is comparable to a light application of nitrogen fertilizer (Hamilton et al. no date).

Conclusion – This alternative would have minor to moderate, adverse, long-term, local effects on geological resources if heavy equipment was operated on rock shelves or surfaces. Alternative A would have negligible to minor, adverse, short-term effects on the soils resource as any effects would be local in nature.

Impairment Determination – The implementation of this alternative would not significantly impair geological or soils resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B
Analysis – Under Alternative B, all human-caused fires would be suppressed. Heavy equipment could potentially be used during suppression which could adversely impact rock ledges through

cracking or crushing. Sandscapes are also vulnerable if heavy equipment results in a removal of stabilizing vegetation. Soils can also be compacted by the operation of heavy equipment.

Lightning-caused fires would be managed in Fire Management Zones (appx. 38,100 acres) and suppressed in Fire Exclusion Zones (appx. 4,050 acres), which are primarily around campsites, docks, rangers quarters, visitor contact stations, lighthouses, and historic farming, fishing, and logging structures.

Apostle Islands National Lakeshore has several unique sandscapes including barrier islands, cuspate forelands, tombolos, and sandspits. The structure of these geological features was created by longshore currents, and portions of them are stabilized and maintained by vegetation. Subsequently, if fire were to remove the majority of vegetation on a sandscape erosion could occur. This process could be slowed or halted if vegetation were to re-colonize the quickly. One of the dominant species on these sandscape features is beach grass, which is shallowly rooted and thus susceptible to heat impacts. It is unknown how rapidly beach grass would re-vegetate after a fire.

The effects of fire on soils are variable and depend upon complex interactions between community type, abundance and distribution of fuels, soil type, and fire behavior. For example, fires in grassland communities frequently have little impact on soils. This is because fuels, or any living or dead vegetative materials available to burn, are generally small in size, and the community as a whole is spatially simple. These conditions promote rapid movement of fires over the ground. Damage to soils from fires usually results from heating impacts or by actual consumption, both of which are minimized during fast moving fires. Fire effects on soils in forested communities such as those at Apostle Islands are much more variable due in part to fuel abundance, size, and spatial arrangement and complexity. Fuels vary in size from leaves and twigs to large logs, and these fuels are randomly distributed both on the ground and aerially. In some situations fires will remain in the tree canopies and have little impacts on the ground. At other times dead and down woody material on the ground becomes involved which increases the residence time of fires and the potential for local impacts.

The protective vegetative cover, and soil litter and duff, can be consumed during fires thus exposing underlying soils to the direct impact of raindrops and allowing soil particles to be carried away in runoff as suspended sediments. Disturbed soils on steeper slopes are more vulnerable to runoff, and tend to be thinner, so damage to soils and the vegetation they support on these sites can be longer-lasting. Increased runoff can remove soils and leach soluble nutrients (mostly nitrogen, but also potassium, magnesium, and calcium).

Heating impacts from fires can kill soil microbial and invertebrate organisms that break down plant litter. However, most fires burn in a mosaic pattern which provides refuges that allow for re-colonization. Fire can also volatilize certain soil nutrients; others are lost in small smoke particles. The addition of ash to the soil generally increases the availability of nutrients in soils, which is beneficial.

Conclusion – Implementation of this alternative would have the same effects on geology and soils resources as Alternative A relative to fire suppression activities. The effects would likely

occur less often due to the fact that lightening-caused fires would not be suppressed, only human-caused fires would receive this type of response. The operation of heavy equipment on rock ledges can have crushing effects, and can cause compaction of soils. Effects of managing wildland fire use would be negligible to minor due to likelihood of occurrence, and their localized nature, and would likely be short-term.

Impairment Determination - The implementation of this alternative would not significantly impair geologic and soil resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis –The effects of suppressing human and lightning-caused fires would be the same as those described under Alternative A, with heavy equipment potentially crushing portions of rock ledges, and causing compaction of soils.

The effects of wildland fire use on geology and soils would be the same as those under Alternative B. Fire could potentially remove vegetation on sandscapes which could erode these sensitive geological features. The effects on soils are variable and range from little impact in grassland communities, in which fires move fast and thus do not heat the ground, to detrimental effects such as consumption of the soil resource in more complex forested communities, which are subject to more intense fires. The latter can result in more erosion, especially on steeper slopes. Heat of fire can also kill soil microbial populations and invertebrate organisms if a fire is intense enough. This effect is usually minimized by the fact that most fires burn in a mosaic pattern which allows for re-colonization. Fires can also volatize soil nutrients; others are lost as smoke particles.

Prescribed fires would be completed either to mimic wildland fire (in areas where wildland fire use would not be a good option due to proximity of high Visitor Use Areas, and/or valuable resources), to reduce unnatural accumulations of fuels, or to maintain cultural landscapes.

Any effects related to controlling prescribed fires would be associated with heavy equipment being offloaded or driven on rock ledges. This is possible during these actions but not highly probable due to wilderness considerations and the island nature of the Park. Prescribed fires would not be completed near sandscapes so no effects would be expected. No effects are expected from prescribed fires themselves on geological resources.

Prescribed fires can have a combination of effects on soils that are similar to those associated with both suppression and wildfire. Control and suppression effects would be similar to those described under Alternative A but likely to be less intense. This is because prescribed fires are planned out and implemented under ideal conditions whereas human and lightning-caused fires occur somewhat randomly and usually under more variable conditions. The use of heavy equipment is not likely during prescribed fire operations on the islands. The effects of prescribed fires on soils would likely be minimal because these types of fires are executed under controlled conditions. Subsequently, fire intensity and residence time are generally minimized which

reduces the likelihood of soil impacts. In addition, only small amounts are likely to be burned in any given year.

Conclusion – Implementation of this alternative would have effects to geology similar to Alternative B that are negligible to minor, adverse, localized, and long-term; and to soils that are negligible to minor, adverse, short-term, and localized. Effects of controlling prescribed fires would be negligible to minor, adverse, but long-term on geological resources if heavy equipment were offloaded or operated on rock ledges. Effects to soils resources would be negligible due to the small amount of acreage involved and the fact that prescribed fires rarely have the heat and residence time required to damage this resource.

Impairment Determination **-** The implementation of this alternative would not significantly impair geologic and soil resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Cumulative Impacts – There are no other reasonably foreseeable actions affecting the Park's geology and soils in the future, to which the impacts of these alternatives would be added. None of the alternatives discussed above would be likely to result in or contribute to adverse, cumulative impacts, such as soil degradation or disappearance, over the short or long term. Soil formation processes would continue to take place under each alternative, so that soils are regenerated adequately.

4.1.4 Floodplains and Wetlands

Methodology/Basis of Analysis
Potential impacts to the area, and function of floodplains and wetlands, as well as associated plant and animal species viability were qualitatively assessed by means of reviewing literature and applying professional judgment and experience.

Intensity

Negligible - No change would occur in an existing wetland area or function, the ability of a floodplain to convey floodwaters, or to associated vegetation and wildlife communities. No U.S. Army Corps of Engineers 404 permit would be necessary.

Minor - No change would occur in wetland or floodplain area or function. Actions would affect a few individuals of plant or wildlife species within an existing wetland or riparian area within the Park. The change would require considerable scientific effort to measure and have barely perceptible consequences to wetland or riparian habitat area or function. A U.S. Army Corps of Engineers 404 permit would not be required.

Moderate - Change would occur in an existing wetland area or in floodplain function, but the impact could possibly be mitigated by the creation of artificial wetlands or modification of proposed facilities in floodplains. The action would have a measurable effect on plant or wildlife species within an existing wetland or riparian area, but all species would remain indefinitely viable within the Park. A U.S. Army Corps of Engineers 404 permit could be required.

Major - An action that would have drastic and permanent consequences for an existing wetland or floodplain area or function which could not be mitigated. Wetland and riparian species dynamics would be upset, and species would be at risk of extirpation from the Park. A U.S. Army Corps of Engineers 404 permit would be required.

Duration

Short-Term - Recovery would take less than 1 year.

Long-Term - Recovery would take longer than 1 year.

Extent

Localized – Impacts would affect floodplains and wetlands only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect floodplains and wetlands throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect floodplains and wetlands on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A

Analysis – Alternative A, or the No Action Alternative, would suppress all human and lightning-caused fires throughout the Park.

Compliance with Executive Orders 11988 on Floodplain Management and 11990, Protection of Wetlands, requires that effects of any management activities be minimized in these communities. Best Management Practices and Minimum Impact Suppression Techniques would be followed in order to accomplish those goals.

Suppression tactics that could conceivably impact floodplains and wetlands include heavy equipment operations, fire line construction, and the use of retardant and/or foam. However, none of these practices are likely in a floodplain or wetland due to inherent difficulties and the potential for adverse impacts.

The natural fire return interval in the predominant community types on the islands is infrequent, ranging from 350 to 1,000 years during which time fuels are constantly accumulating and decaying. Typically these communities would burn during times of drought stress. Suppressing these already infrequent fires would have the effect of promoting unnatural accumulations of fuels and rare, more intense fires with more unpredictable behavior. As mentioned in the water quality section, intense fires can remove excess amounts of vegetation, decrease infiltration and absorption of water, and subsequently increase the rate of runoff. If this occurs, there is likely to be some flooding.

Conclusion – Any short-term effects would likely be negligible to minor, and localized due to the likely avoidance of floodplains and wetlands during suppression activities. The potential for a rare but intense fire is low. However, the effects of such a fire would likely be minor to moderate, long-term, and localized.

Impairment Determination - Implementation of this alternative would not significantly impair floodplains and wetlands or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – Any effects associated with suppressing human-caused fires would be the same as those described under Alternative A. The use of heavy equipment in floodplains and wetlands would not likely occur so effects would be negligible to minor, short-term, and localized. Effects of suppressing fires over the long-term could result in rare, but intense fires. This would have effects that were minor to moderate, adverse, long-term, and localized in nature.

Effects of fires on floodplains and wetlands are variable. Smaller, less intense fires would likely have minimal impacts. This is because floodplains and wetlands frequently have higher humidity's, moist or wet vegetation, and standing water which can shift fires around these communities.

However, larger, more intense fires can increase the rate of runoff by reducing vegetative cover and disturbing soils. This in turn can raise the peak of the hydrograph of streams in affected watersheds, that is, increasing the volume and velocity of waters flowing in streams during and immediately after storm events. This pulse of water can then produce some level of flooding, scouring, stream bank erosion, and sedimentation. However, the relatively flat topography of the Park (in comparison with eastern or western mountainous areas) would limit erosion and flooding. In addition, vegetation can return quickly to provide stabilization. This is because wildland fires typically burn in a mosaic pattern which provides a source of vegetation for reseeding or germination, and vegetation frequently benefits from a nutrient pulse provided during fire.

Conclusion – The effects of suppressing human-caused fires would be the same as Alternative A; negligible to minor, and localized over the short-term due to avoidance of these communities, and minor to moderate, and localized over time if a rare, but intense fire occurred due to the accumulation of fuels. The effects of fires on floodplains and wetlands would be negligible to minor, localized, but potentially long-term, taking a few years to return to normal conditions.

Impairment Determination - Implementation of this alternative would not significantly impair floodplains and wetlands or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis –The effects of suppressing human-caused fires would be the same as those described under Alternative A. Wetlands and floodplains would likely be avoided during suppression actions which would minimize effects over the short-term. Over the long-term, if all fires were suppressed fuels would accumulate which could potentially result in a rare, but intense fire. Larger, more intense fires can increase the rate of runoff by reducing vegetative cover and

disturbing soils. This can produce some level of flooding, scouring, stream bank erosion, and sedimentation. The relatively flat topography of the Park should minimize the potential for these types of impacts.

The effects of managing wildland fire use would be the same as those under Alternative B. Smaller, less intense fires would have minimal impacts as fires would likely move around these moist types of communities. Larger, more intense fires could result in more flooding. This stems from removing vegetative cover and disturbing soils. Rainfall hitting such an area would move rapidly into streams, and potentially result in flooding, scouring, stream bank erosion, and sedimentation.

Alternative C allows prescribed fire in the Park and specifically identifies approximately 600 acres for prescribed fires, none of which are proposed near floodplains or wetlands. Prescribed fires require the establishment of a perimeter for containment purposes. Methods most likely to be used include the construction of hand lines. Other tactics include creation of wet line with either foam or water. These activities would likely have minimal effects on floodplains or wetlands.

Conclusion – Any effects associated with suppression of human-caused fires would be negligible to minor, adverse, short-term, localized due to the avoidance of these communities during suppression activities. The effects of wildland fire use would be the same as those under Alternatives A and B, negligible to minor, adverse, localized, but potentially long-term, taking a few years to return to normal conditions. The effects of prescribed fires on floodplains or wetlands would be non-existent to possibly negligible, and localized. This is because prescribed fires are not currently proposed near floodplains or wetlands.

Impairment Determination – Floodplains and wetlands would likely be avoided during suppression activities. Smaller, less intense fires would likely move around wet communities. Prescribed fires are not currently proposed near any floodplains or wetlands. Therefore, implementation of any of the alternatives would not significantly impair floodplains and wetlands or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

No other reasonably foreseeable, future projects within the park or outside its borders are known that would combine with any of the alternatives to generate significant cumulative impacts on floodplains and wetlands.

4.1.5 Ecological Communities and Vegetation

Methodology/Basis of Analysis
Potential effects were qualitatively assessed by means of a review of relevant literature, professional judgment, and experience with comparable actions. In addition, maps depicting ecological community types were created using Geographic Information System (GIS) technologies based upon topography, soils, and presettlement and current vegetation types. This

was completed to define the natural range of variability, and to determine likely successional pathways of current vegetation, both of which were necessary to predict the effects of fires on various community types. At the larger scale, effects of any potential impacts were evaluated based on whether or not they would maintain the distribution of ecological communities within the natural range of variability. At the smaller scale, effects were addressed relative to their potential to impact the viability of native vegetation.

Intensity

Negligible – Effects to communities would not occur or would be short-term, on a small scale, and within the natural range of variability. No native vegetation would be affected or some individual native plants could be affected as a result of the alternative, but there would be no effect on native species populations. The effects would be short-term, on a small scale, and no rare species would be affected.

Minor – Effects could occur to portions of ecological communities, but the change would be small, localized, and of little consequence. Mitigations to offset adverse effects could be required and would be effective. The alternative would affect some individual native plants and also a relatively minor portion of that species' population. Mitigation to offset adverse effects, including special measures to avoid affecting rare species, could be required and would be effective.

Moderate – Effects would occur to a sizeable portion of various ecological communities over the long-term. Mitigation to offset adverse effects could be extensive, but would likely be successful. The alternative would affect some individual native plants and would also affect a sizeable segment of the species' population in the long-term and over a relatively large area. Mitigation to offset adverse effects could be extensive, but would likely be successful. Some rare species could also be affected.

Major – Considerable changes to various ecological communities would occur with long-term effects. Communities would be shifted outside the natural range of variability. Mitigation measures would be required, and would be extensive. Success of these measures would not be guaranteed. The alternative would have a considerable long-term effect on native plant populations, including rare species, and affect a relatively large area in and out of the Park. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed.

Duration

Short-Term - Recovers in less than 3 years.

Long-Term - Takes more than 3 years to recover.

Extent

Localized – Impacts would affect ecological communities only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect ecological communities throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect ecological communities on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A

Analysis – Under Alternative A, the no action alternative, all human and lightning-caused fires would be suppressed, and no prescribed fires would be implemented. None of these activities would shift ecological communities outside of their historic range of variability.

The effects of suppression on vegetation would be local in nature and related to the tactics used. Heavy equipment can crush shrubs and vegetation. Frequently, this is a short lived effect because individuals can return to their pre-disturbed condition. Any tracked vehicle has the potential to introduce non-native vegetation because seeds can be transported on tires. This would be addressed by mitigations (see Chapter 2). Fire line construction requires that vegetation be removed which results in destruction in a relatively small area. Retardants can have a short-term fertilizing effect on vegetation as a result of the nitrogen-fertilizing properties of the agent. The use of heavy equipment is more likely on the Mainland Unit due to logistics. Subsequently, these effects may be more likely there, rather than the islands or designated wilderness.

Suppressing lightning-caused fires has the effect of altering the natural disturbance regime of an area. This would have various impacts depending upon the community type in question. Disturbance frequencies vary by community type (see Table 3.1.7.1 in the Affected Environment section) from forest maintenance fires every 5-15 years in red oak forests to forest replacement fires every 350 to 1,000 years in hemlock forests. Community types that are maintained by fire are usually adapted to this disturbance and typically benefit. Positive aspects of fire to individual vegetative species include higher seed germination rates, earlier root growth and shoot emergence, robust growth, reduced competition and disease, increased vegetative reproduction and increased berry production. Fire adapted community types would not experience these benefits under a suppression strategy.

As the length of time that fire is excluded from a dependent ecosystem increases, the number and density of non-fire-dependent species can increase. This can compound the effect of fire suppression, place additional stress on the original vegetation and further reduce native diversity. The resulting composition of species and the stand structure can become less diverse than what would have occurred under natural regimes. Early successional communities can be reduced in acreage as well as they succeed to later seral stages. At the present time approximately 3% of the Park is red oak and jack pine and this acreage is found predominantly on Long Island.

Conclusion – Effects of implementing this alternative would be minor to moderate, long-term, and local. Suppressing lighting caused fire would not support natural processes which could have longer term consequences to structural and species diversity.

Impairment Determination -Implementation of this alternative would not significantly impair ecological communities and vegetation or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – The effects of suppressing human-caused fires are the same as those described in Alternative A. At the larger scale, suppression can be detrimental to communities that benefit from fire. These communities are adapted to this natural process and maintained by it. At the smaller scale, suppression activities can impact local vegetation by crushing, or removing in the short-term or in the long-term by increasing competition through the introduction of exotic species.

Implementation of this alternative would support the natural fire disturbance regime of the Park. Ecological communities are associated with different fire frequencies and each community type is affected by fires in different ways. Community types that burn more frequently are typically associated with a forest maintenance strategy in which a low intensity fire promotes the continuation of existing conditions. Forest maintenance type fires alter with less frequent, but more intense fires that result in replacement of much of the original forest. Less fire prone community's burn infrequently but often more intensely, which results in the replacement of much of the original forest. Regardless of what type of community is involved, fires frequently burn in a mosaic pattern leaving various sized and spaced areas unaffected by fire. These areas typically support both adults and saplings or seedlings of one to a few species of trees. The surviving adults provide seeds to the post-fire environment and the saplings or seedlings often grow vigorously as a result of increased light availability.

Approximately 5% of the Park is comprised of Dry Mesic forests, or those that are dry to moderate in their amount of moisture (see table 3.1.6.1) These forests are characterized by Light Intensity Fires (LIF) (Dickmann and Cleland 2002), alternating with less frequent Forest Replacement Fires (FRF). Light Intensity Fires have the effect of maintaining the existing aspen, birch, oak, and jack and red pine communities. If a Forest Replacement Fire were to occur some oaks, and red, and white pines would survive due to various protective characteristics such as thick bark, deeper roots, and higher branches. Others would be killed. Paper birch, red maple, and big-toothed and trembling aspen would likely be top killed by fire. However, these earlier successional species readily re-sprout after fire and for a period of time would rise in importance in burned dry mesic communities. The birch and aspen species are shorter lived and over time (100-150 years) would break apart and die allowing the forest to succeed to longer lived red maple, and red and white pine species. The earlier successional species would be maintained in smaller pockets created by blowdown or death of single trees. The resulting forest would be similar to the original, pre-fire community but with more structural diversity due to the mosaic effect of fires, and the rise and fall of aspens and birch.

Mesic forests typically undergo forest replacement when impacted by fire. This occurs infrequently, but more intensely and can be larger scale in size. Various species would be retained in unburned patches as a result of the mosaic pattern that fires typically burn under. However, within the area actually burned, sugar maple, yellow birch, and hemlock, the dominant species, would be killed. Hemlock is especially sensitive to fire and is considered to be the most-sensitive, mesophytic species in its range. This is due to thin bark, shallow roots, low branching habits, and heavy litter deposits. Some white pine would survive. Species somewhat adapted to conditions created by fire such as aspen and birch would invade and have a competitive advantage for a time. Pure stands of white birch would be possible. Sugar maple,

and to a lesser degree yellow birch, would eventually return and assume dominance, with hemlock the last to reestablish. Over time the forest would resemble the original with more structural diversity as a result of mosaic burning, and rise and fall of aspen and birches. These species would likely be retained as minor components in the forest and would take advantage of openings in the canopy created by single tree death or blowdown for perpetuation.

There are several old growth forests in the Park on Devils, North Twin, Outer, Sand, and Raspberry islands. These forests are either Dry Mesic or Mesic community types. They would respond to fire in much the same way as described above. However, some of the features of old growth include spatial complexity due to a multi-storied canopy, large amounts of coarse woody debris, and deep duff layers that accumulate only after sufficient time has passed. These features of old growth forests could be reduced under this alternative if a fire occurred. Some old growth stands are in and around light stations that have been zoned as fire exclusion areas which should prevent any impacts.

Wet Mesic forests would be most likely to burn during periods of drought, which results in rare but more severe fires. The mosaic pattern of burn would be greater and unburned patches would likely be closer to sources of water. Balsam fir, black spruce, cedar, and tamarack can all be killed by fire. Cedar is especially vulnerable due to a high oil content of the needles. After fire black spruce would likely reestablish first due to the storage of seeds in the crowns of trees. Cones frequently open as a result of the heat of fire. Tamarack and white spruce would likely invade 1-2 years after fire because these species depend upon wind dispersed seeds over short distances for regeneration. Balsam fir would follow and eventually cedar would return. However, cedar can be very slow in returning to an area if the peat burns and humus is destroyed.

Wet forests and bogs are similar to Wet Mesic forest but they are wetter and experience even more infrequent, forest replacement fires. They would progress very similarly to wet mesic forests.

Conclusion – The effects of wildland fire use would be negligible to moderate, long-term, and local to most forests. Many of these effects would be beneficial. The effects of wildland fire use to old growth forests would be negligible to minor, and long-term, and these effects would be adverse.

Impairment Determination –Implementation of this alternative would not significantly impair ecological communities and vegetation or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis - The effects of suppressing human-caused fires are the same as those described in Alternative A. At the large scale, fire suppression can negatively impact communities that can benefit from fire. In these communities vegetation is adapted to fire and responds with accelerated germination, growth, and reproduction. These benefits would not be experienced.

At the smaller scale, suppression activities can impact local vegetation by crushing, or removing in the short-term or in the long-term by increasing competition through the introduction of exotic species.

The effects of managing lightning-caused fire are the same as those in Alternative B, and they would vary by community type. More fire adapted communities would benefit and respond with increased germination rates, growth, and reproductive success. Dry Mesic and Mesic forests would likely increase in diversity in the long-term due to the mosaic effect of fires, and the rise and fall of aspens and birch that would occur over time. Old growth forests would likely adversely impacted in that the degree of species and spatial complexity could be reduced. Wet Mesic, and Wet forests, and bogs would burn very infrequently, and the mosaic pattern of burning would be stronger, and tied to water sources.

Prescribed fires are proposed in Dry Mesic forest or around structures. The effects of prescribed fires would be the same as those described under Alternative B for light intensity fires, which would simply be to maintain the current forest condition.

Conclusion – Effects would be the same as those described under Alternative A for suppressing human-caused fires, minor to moderate, adverse, long-term, and localized. However, this alternative would implement wildland fire use, which would have negligible to moderate, beneficial, long-term, and local effects to most forests. Effects of implementing prescribed fires on 600 acres would be minor, beneficial, short-term, and localized.

Impairment Determination - Implementation of this alternative would not significantly impair ecological communities and vegetation or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Cumulative Impacts – Alternative A, the complete suppression alternative, would continue to build upon the prior cumulative impacts of the better part of a century of fire suppression on community structure, age class, and composition. The other alternatives, to one degree or another, represent a break from the results of the unnatural suppression approach to fire management.

There tends to be beneficial cumulative impacts on forest resources related to a more realistic assessment of the ecological role of fire and its potential as a habitat management tool. Increasing the use of prescribed fire and wildland fire use in the Great Lakes region reflects this new understanding.

4.1.6 Natural Processes

Methodology/Basis of Analysis

Potential effects were qualitatively assessed by means of a review of relevant literature regarding natural disturbance types and frequencies, and the role of coarse woody debris in nutrient

cycling, professional judgment, and experience with comparable actions. Maps depicting ecological community types were created in GIS based upon topography, soils, and presettlement and current vegetation types. These actions were completed to define the natural range of variability, and to determine likely successional pathways of current vegetation, both of which were necessary to predict the effects of fires on various community types, and whether or not they would remain within the natural range of variability under the various alternatives. Data from transects identifying the amount of coarse woody debris (CWD) from 9 sites, representing 6 community types were reviewed as well to attempt to determine acceptable amounts of CWD by size class and community type.

Intensity

Negligible – No effects would occur to natural disturbance processes. The amount of coarse woody debris would not be affected or the effects would be minimal and localized.

Minor - No effects would occur to natural disturbance processes. A minor amount of coarse woody debris would be affected, but effects would be localized. If mitigation measures were needed to offset adverse effects, they would be relatively simple to implement and would likely be successful.

Moderate – Minimal effects would occur to natural disturbance regimes but they would remain within the natural range of variability. Coarse woody debris would be reduced across a larger area that may cross into more than one community type. Mitigation to offset adverse effects could be extensive, but would likely be successful.

Major – Impacts would move natural disturbance regimes outside of their natural range of variability. The amount of coarse woody debris removed would be readily apparent, long-term, and substantially change the character of the decay and nutrient cycling processes over a large area. Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

Duration

Short-Term – Recovery would take less than 3 years.

Long-Term – Recovery would require longer than 3 years.

Extent

Localized – Impacts would affect natural disturbance processes only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect natural disturbance processes throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect natural disturbance processes on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A

Analysis – This alternative would suppress human and lightning-caused fires, and would not implement prescribed fires.

Human-caused fires typically start in or around Visitor Use Areas such as campsites or docks. Frequently these fires do not mimic the predominant natural disturbance type or the appropriate frequency. Suppressing these fires would maintain the natural disturbance regime.

Suppressing lighting caused fires alters the natural disturbance regime. Fire suppression functions to remove a natural disturbance process which can have harmful effects on biodiversity and ecosystem health. This alternative would maintain the amount of course woody debris at current levels and allow it to accumulate over time.

Conclusion – Effects of this alternative would be negligible to moderate, adverse, long-term, and localized to local.

Impairment Determination –. Implementation of this alternative would not significantly impact, and thus impair the natural processes, the amount of coarse woody debris, or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents. However, this alternative does not support NPS direction to manage for natural caused disturbances.

Alternative B

Analysis –Implementation of this alternative would support natural disturbance regimes by suppressing human-caused fires and implementing wildland fire use. Human-caused fires frequently occur at frequencies and locations which are not within the appropriate natural disturbance regime. Supporting natural processes are essential for biodiversity and ecosystem health. Ecosystems are constantly changing. Averill (et. al 1994) stated "The long-term health of ecosystems is linked to disturbance. Recurrence of disturbance and recovery within ecosystems is an important mechanism for energy flow and nutrient cycling, and for maintaining age, species, genetic, and structural diversity, all attributes of ecosystem health". Fire promotes more diverse communities and a wider variety of successional states. The importance of allowing natural disturbance processes to function was recognized in the General Management Plan, the guidance of which would be followed by implementing wildland fire use in this alternative.

Implementation of this alternative could have impacts on the amount of coarse woody debris in the Park. This resource has changed over time as a result of natural accumulation, logging, post-logging fires, and suppression practices. Today the amount of CWD varies between and within islands as a result. More fire prone communities such as Dry Mesic forests burn more frequently under natural regimes, and subsequently usually have less CWD. Suppression has possibly prevented fire from cycling CWD and implementation of wildland fire use could reverse this condition.

In less fire prone communities, where the dominant disturbance type is wind, CWD is common and normal. Fire in these types of communities occurs less often but would likely reduce the amount of CWD. Coarse woody debris is high in the old growth conifer forests on Devils and Raspberry Islands, as well as in the old growth hemlock forests on the north end of Outer Island. Fires would likely reduce the amount of CWD in these stands. While fire is a natural process, the rareness and scientific value of these forests must be considered. Some of the Apostle Islands old growth stands are among the oldest, and therefore rarest, forests in the Great Lakes states. Several stands are within Fire Exclusion Zones which should minimize impacts.

Conclusion – Implementation of this alternative would have negligible to moderate, long-term, localized, beneficial effects to most forests. Effects of fire to the very rare old growth forests of the Park could be minor to moderate, adverse, long-term, and local to regional.

Impairment Determination – Implementation of this alternative would suppress human-caused fires, and manage lightning-caused fires. Both of these activities would promote the natural disturbance regimes inherent to the Parks ecological communities. Subsequently, this alternative would not result in an impairment of natural disturbance processes in the Park.

Implementation of this alternatives would not significantly impact, and thus impair the natural processes, the amount of coarse woody debris, or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – Implementation of this alternative would also support natural disturbance regimes by suppressing human-caused fires and implementing wildland fire use. Supporting natural processes promotes biodiversity and ecosystem health. In addition, this alternative would implement prescribed fires.

Under Alternative C, the Fire Management Plan would use prescribed fire in the Park. Currently there are approximately 600 acres proposed, some of which is located in the Dry Mesic forest community type (5% of the Park). Wildfires are more likely to start in these dry communities so suppression is likely to occur more frequently. Suppression is also more likely to be detrimental to these fire adapted communities in terms of biodiversity and ecosystem health. Prescribed fire can be safely used to reverse this situation. In addition, prescribed fire can be used in areas where it would likely be unsafe to manage lightning-caused fires. This would allow a mimicking of lightning-caused fires in these areas.

Conclusion – Effects of suppression would be negligible to moderate, adverse, long-term, and localized. These effects would most likely be tied to VUA's, the areas most often impacted by human-caused fires. The effects of wildland fire use would be negligible to moderate, local, and beneficial to most forests over the long-term, especially those that are somewhat fire-dependent. Effects to the very rare old growth forests of the Park could be minor to moderate, adverse, long-term, and localized to regional. The effects of implementing prescribed fires would be negligible, short-term, and localized.

Impairment Determination – Natural processes would be supported in this alternative as a result of suppressing human-caused fire, and managing wildland fire use. Implementation of this alternative would not result in impairment to natural processes in the Park.

Implementation of this alternative would not significantly impact, and thus impair the natural processes, the amount of coarse woody debris, or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to

the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Cumulative Impacts – Implementation of Alternative A would build upon the effects that have occurred over the last century of fire suppression. Alternatives B or C would stop this trend and promote a more natural disturbance process.

4.1.7 Fuels

Methodology/Basis of Analysis
Fuels will normally be present to varying degrees in any ecological community type, and they change over time in abundance and distribution. Acceptable levels of fuels are those considered within the natural range of variability for the community type in question and this was the criteria used in this evaluation. It is important to consider fuels because they strongly impact how fire behaves, which can have affects to other resources.

Potential effects were qualitatively assessed by means of a review of relevant literature, professional judgment, and experience with comparable actions. In addition, previous fuel monitoring data from 9 sites, representing 6 community types were reviewed. A fuel model map was also created by combining standard fuel models with the vegetation types found at Apostle Islands. These sources of information were used in an attempt to understand the current levels of fuels in the Park and to determine if any impacts would alter acceptable amounts of fuels by community type to any degree.

Intensity

Negligible – The amount of fuels would not be affected or the effects would be minimal and localized.

Minor – A minor amount of fuels would be affected, but effects would be localized.

Moderate – Fuels would be reduced across a larger area that may cross into more than one community type.

Major – The amount of fuels removed would be readily apparent, and long-term.

Duration

Short-Term – Recovers in less than 3 years.

Long-Term – Takes more than 3 years to recover.

Extent

Localized – Impacts would affect fuel loadings only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect fuel loadings throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect fuel loadings on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A

Analysis – This alternative would suppress human and lightning-caused fires, and would not implement prescribed fire in the Park.

Suppression activities that could conceivably be used with potential impact to fuels include establishment of base camps and helipads, back burning, blasting, fire line construction by hand or with heavy equipment, and hydro mining. These practices could consume, reduce, or rearrange fuels. Reducing fuels in size alters how they burn with smaller fuels burning more quickly, and less intensely. As has been previously mentioned, some tactics such as back burning and construction of fire lines by hand are more likely than others, due in part to the island nature of the Park. In these scenarios fuels could be consumed by fire or broken and redistributed by the creation of fire lines.

The main difference between suppressing human-caused versus lightning-caused fires is related to where a given fire would likely occur. Human-caused fires typically occur in and around either Visitor Use Areas or trails. Collection of fire wood is allowed in the Park and these areas are more likely to have lower fuel loadings as a result. Conversely, lightning-caused fires can occur anywhere in the archipelago, where the amount of fuels ranges widely. Suppression effects would be the same but the magnitude of effect may be greater due to amount of fuels available. Over the long-term, suppressing lightning-caused fires would have the effect of promoting the accumulation of fuels.

Not being able to use prescribed fire as a management tool could affect the Parks ability to effectively manage unacceptable fuel loadings near cultural resource sites which would, over time, continue to accumulate. Eventually, this could result in more intense fire.

Conclusion – The effects of fire suppression activities would be negligible to minor, adverse, localized, and potentially long-term, as the area likely impacted would be small, but the amount of fuels would take some time to return to pre-activity conditions.

Impairment Determination – Suppression tactics likely to be used in the Park would impact fuels but over relatively small areas. The effects of suppressing human-caused fires in and around VUA's would be minimal due to lower levels of fuels in these areas as a result of firewood collection.

Implementation of this alternative would not significantly impact, and thus impair the amount of fuels, or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – The effects of suppressing human-caused fires and not using prescribed fire as a management tool are the same as what was described for Alternative A. Suppression tactics could alter the size, shape, and distribution of fuels which affects fire intensity. Suppressing

human-caused fires would have minimal affects as a result of low amounts of fuels in and around VUA's, where most of these types of fires start.

Fuels are produced annually by growth of leaves and twigs. They are constantly rearranged by leaf fall, and by small and large wind storms which can impact all sizes of fuels. Fuels have accumulated over time as a result of this, past logging practices, and fire suppression which has been in place since the early 1900's. Implementation of this alternative would reduce the amount of fuels in the Park over the long-term because lightning-caused fires would be allowed to function naturally and consume fuels.

Conclusion – The effects of this alternative would likely be minor to moderate, beneficial, long-term, and localized to local because establishing a more natural fire regime would maintain a fuel loading within the natural range of variability.

Impairment Determination – Implementation of this alternative would not significantly impact, and thus impair the amount of fuels or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents

Alternative C

Analysis – The effects of suppressing human-caused fires were described under Alternatives A and B. Fuel size, shape, and distribution can be altered by suppression tactics, which subsequently affects fire intensity. Human-caused fires typically start in and around Visitor Use Areas, which typically have lower amounts of fuels due to firewood collection. Effects of suppressing these fires would therefore have minimal effects. Suppressing lightning-caused fires would have the effect of promoting the accumulation of fuels.

The Park would have more ability to address fuels management with prescribed fire as a management option. Fuels would be effectively reduced in a targeted, controlled manner in specific areas.

Conclusion - The effects of suppressing human-caused fires would be negligible to minor, beneficial, localized, and potentially long-term, as the area likely impacted would be small, but the amount of fuels would take some time to return to pre-activity conditions. The effects of managing wildland fire use on fuels would likely be minor to moderate, beneficial, long-term, and localized to local. The effects of prescribed fire would be negligible to minor due the localized area in question, and long-term due to the amount of time required for fuels to return to pre-burn conditions.

Impairment Determination -Implementation of this alternative would not significantly impact, and thus impair the amount of fuels or values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Cumulative Impacts – The effects of continuing fire suppression practices as described under Alternative A would further compound the accumulation of fuels in the Park into the foreseeable future. Eventually it is possible that a rare, but intense fire could occur that would be more intense as a result. Implementation of either Alternative B or C would stop fire suppression which would promote acceptable levels of fuel loadings. Implementation of Alternative C would allow the Park further control over fuel levels through the use of prescribed fire.

4.1.8 Rare, Threatened, and Endangered Species

Methodology/Basis of Analysis

Potential effects to species viability relative to habitat alteration or direct mortality were qualitatively assessed by means of a review of relevant literature, professional judgment, and experience with comparable actions.

Intensity

Negligible - No Federally listed species would be affected or the alternative would affect an individual of a listed species or its critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population. Negligible effect would equate with a "no effect" determination in U.S. Fish and Wildlife Service terms.

Minor - The alternative would affect an individual or individuals of a listed species or critical habitat, but the change would be small. Minor effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would be accompanied by a statement of "likely…" or "not likely to adversely affect" the species.

Moderate - An individual or population of a listed species, or its critical habitat would be noticeably affected. The effect could have some long-term consequence to the individual, population, or habitat. Moderate effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would be accompanied by a statement of "likely…" or "not likely to adversely affect" the species.

Major - An individual or population of a listed species, or its critical habitat, would be noticeably affected with a long-term, vital consequence to the individual, population, or habitat. Major effect would equate with a "may effect" determination in U.S. Fish and Wildlife Service terms and would be accompanied by a statement of "likely…" or "not likely to adversely affect" the species or critical habitat.

Duration

Short-Term - Recovers in less than 1 year.

Long-Term - Takes more than 1 year to recover.

Extent

Localized – Impacts would affect rare species only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect rare species throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect rare species on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A

Analysis – This alternative would result in the suppression of all human and lightning-caused fires, and would make no allowance for the use of prescribed fire.

Suppression activities could have negative impacts to some rare plant communities. Several species of rare plants are associated with rock ledges. If heavy equipment were offloaded or operated at these types of sites rocks can be crushed or become separated from the surface. This in turn can destabilize local populations of associated rare plants. Operating heavy equipment while en route, or at a fire should have minimal impacts because most of the Parks rare plants are located either along rock ledges or caves, or in wetlands where it is unlikely that heavy equipment would be used. The operation of heavy equipment is less likely on islands and in proposed wilderness.

Overall, disturbance effects to wildlife would be less likely during suppression activities associated with human-caused fires versus lightning-caused fires. This is because human-caused fires are more likely to occur in or around Visitor Use Areas, which may be less likely to be used by wildlife.

Threatened or endangered wildlife species at the Park include the gray wolf, peregrine falcon, bald eagle, and piping plover. Disturbances are greatest when it is associated with a critical migration, breeding, nesting, denning or young rearing period. There are no known resident wolf populations, only transient animals which minimizes the potential for effects on mating or denning activities for this species.

Outer Island is a significant resource for peregrine falcons during fall migration, especially in and around the sand spit at the south end of the island. Falcons typically feed on passerines in this area immediately after making the Lake Superior crossing. Suppression activities during the month of September could impact falcons by reducing the availability of prey (as a result of avoidance) and disrupting feeding (as a result of disturbance).

Eagle nests are identified through annual aerial flights. Bald eagles nested in 10 locations on 7 islands and on the Mainland Unit in 2004. Bald eagles nest in February or March, and the females lay eggs in late March, early April. Eggs hatch about 40 days later. The timing of these events suggests that breeding and egg-laying activities would not likely be impacted by fire suppression activities. However, fires can occur in the spring prior to green-up. Eaglets would still be in nests during this time and could potentially be disturbed by suppression activities. However, mitigation measures which require avoidance of nest sites would be implemented to minimize impacts but disturbance alone can conceivably cause adults to abandon nests and chicks.

Piping plovers are frequently present on Long Island, which was designated Critical Habitat by the U.S. Fish & Wildlife Service (2001), during late spring and early summer and nesting is possible. Nests are on built on the beach and are extremely difficult to see. Nesting behavior is closely monitored by Planning and Resource Management staff and any nests are protected with exclosures and buffer zones in cooperation with the U.S. Fish & Wildlife Service, the Wisconsin Department of Natural Resources, and the Bad River Indian Tribe. Any activity with the

potential for impacts requires consultation with the U.S. Fish & Wildlife Service. Subsequently, suppression activities including the creation of fire lines should not be done in areas of plover nesting. If activities did occur inadvertently, they would be negative. Landing boats or off-loading equipment near nests could impact this species through disturbance. Not heeding exclosures could have adverse impacts or actual damage to eggs or chicks. Suppression activities should be completed well enough away from known or suspected nesting sites to prevent disturbance.

Conclusion – Effects would be negligible to minor, adverse, short-term, and localized.

Impairment Determination – With mitigation, suppression activities should not occur near eagle nests or piping plover habitat. Subsequently, implementation of this alternative would not significantly impair threatened or endangered species or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis - The effects of suppressing human-caused fire and not utilizing prescribed fire are the same as Alternative A. Suppression activities that used heavy equipment on rock ledges could potentially damage rare plants but are not likely to impact entire local populations. Suppression activities including the creation of fire lines would not occur near eagle nests or piping plover habitat.

The effects of wildland fire use on rare plants would be minimal. This is because most rare species occur in nonflammable habitats such as cliff faces, rock shelves, shorelines, or rocky shores or in areas which burn very infrequently such as bogs, interdunal wetlands, or clay bluffs.

Impacts of wildland fire use on rare wildlife would be minimal for all species. First, the likelihood of fire impacting these species is low for various reasons. Wolves are non-resident, and transient. The likelihood of pups on the islands is low and any adults present should be able to move away from or around fires. Peregrine falcons are not known to nest in the Park. The piping plover nests on non-flammable beaches. However, beach grass nearby provides a degree of cover and the removal of this vegetation would be detrimental if it occurred during critical breeding, nesting, or chick rearing periods. Any fires determined to be a threat to bald eagle nesting or chick rearing would be suppressed prior to coming close to nests which would protect young. Subsequently, any effects would be those from suppression.

Conclusion – Impacts would be negligible, adverse, short-term, localized for most species; and negligible to minor, adverse, short-term, and localized for the bald eagle.

Impairment Determination - Thus, implementation of this alternative would not significantly impair threatened or endangered species or related values that are, (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore (2) key to

the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – The effects of suppressing fires on rare plants should be minimal. While offloading or operating heavy equipment of rock ledges has the potential to impact some individual plants it is unlikely that entire local populations would be decimated. Suppression activities would not occur around eagle nests or piping plover habitat or nests.

Effects from prescribed fires are not expected to occur or would be minimal. This is because the needs of these species must be addressed during the planning phase, and acted upon during implementation of any prescribed fires.

As mentioned previously, the majority of rare plant species occur on specific rock or wet habitats that would never be proposed for prescribed fires. In addition, there are no known nesting locations of any of the 3 rare bird species near proposed units. Wolves would not be impacted due to their transient nature in the Park.

Conclusion – Impacts would be negligible, adverse, short-term, localized for most species; and negligible to minor, adverse, short-term, localized for the bald eagle.

Impairment Determination - Thus, implementation of this alternative would not significantly impair threatened or endangered species or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Cumulative Impacts - As with vegetation and wildlife in general, a number of factors have had cumulative effects, largely negative in sum, on the viability of the populations of those organisms that are now listed as threatened or endangered species. These same factors, and others, perhaps climate change for example, would bear on the survival of these species in the future. The trends for some listed species are positive and for others, uncertain, mixed, or negative. There are no particular reasonably foreseeable future projects or actions that, in conjunction with the proposed action, threaten the continued existence of any given listed organism. This EA instead proposes certain measures that would benefit threatened and endangered species through the promotion of natural disturbance regimes and increased habitat diversity.

4.1.9 Wildlife

Methodology/Basis of Analysis

Potential effects to species viability (capable of living and developing under favorable conditions) that stem from habitat alteration or direct mortality were qualitatively assessed by means of a review of relevant literature, professional judgment, and experience with comparable actions.

Intensity

Negligible - Individuals of species populations could be impacted, but there would be no measurable or perceptible consequence to the populations or their viability. There would be no observable or measurable impacts to their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within the range of natural fluctuations.

Minor - Impacts would be detectable, but they would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors may have small, short-term changes, but long-term characteristics remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Impacts would be outside of critical reproduction periods for sensitive species. Sufficient habitat would remain functional to maintain viability of all species. Key ecosystem processes may have short-term disruptions that would be within natural variation.

Moderate - Population numbers, population structure, genetic variability, and other demographic factors for species may have short-term changes, but would be expected to rebound to pre-impact numbers and to remain stable and viable in the long-term. Frequent response to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species. Sufficient habitat would remain functional to maintain variability of all native fish and wildlife species. Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions).

Major - Impacts on native fish and wildlife species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or to be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Breeding colonies of native species might relocate to other portions of the Park. Loss of habitat may affect the viability of at least some native species.

Duration

Short-Term - Recovers in less than 1 year.

Long-Term - Takes more than 1 year to recover.

Extent

Localized – Impacts would affect wildlife only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect wildlife throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect wildlife on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

General Effects
Under each alternative, some wildlife, especially smaller or less mobile organisms, or those that are nesting on or near the ground (including young), would be subject to direct mortality from fires, both wildland and prescribed, and to a smaller extent from suppression actions themselves. Overall, this direct mortality would be relatively inconsequential in terms of its effects on the viability of wildlife populations.

In the absence of fire, uninterrupted succession occurs and potentially reduces or eliminates ecological niches of some wildlife species, among them herbivores such as deer, snowshoe hare, other small mammals (e.g. voles, squirrels), and some species of birds. Many of these species do well in post-fire, early seral stages that provide an ample supply of browse, buds, forage and sprouts.

Short-term toxicity tests have showed that both fire-retardant and foam-suppressant chemicals are highly toxic to aquatic organisms, including algae, aquatic invertebrates, and fish (Hamilton et al., no date). The primary toxin in retardants is ammonia, while in foam suppressants it is the surfactant. If fire-fighters comply with the procedures and buffer zones outlined in the mitigations section of this EA, adverse effects on the Park's aquatic ecosystems should be avoided altogether.

Alternative A
Analysis – This alternative would suppress all fires and would not implement any prescribed fires.

Human-caused fires typically start in and around Visitor Use Areas. Suppression in these areas would likely have fewer impacts to wildlife because they likely provide less, or lower quality habitat to wildlife. Effects of fire suppression away from Visitor Use Areas would be related to how the tactics used would impact wildlife through mortality or decreased success.

Fire suppression typically relies upon aerial attack, burning out, or by the creation of fire lines. By the time these tactics begin to be implemented wildlife have likely become aware of the existence of a fire, and have possibly begun to move out of the area. Disturbance associated with the arrival of suppression crews and equipment would further increase this movement.

However, mortality can occur as a result of suppression tactics if they have a direct impact or prevent an animal from moving to safer ground. Aerial attack, or dropping retardants, foam, or water can result in mortality if wildlife are hit by an air drop which can have a strong force associated with it. It is also conceivable that drops that pond on the ground could prevent small mammals from moving through an area to safer ground. Burnout operations are done to stop fire by removing fuels. Direct mortality is possible, and more likely to affect young birds or animals than more mobile adults. The creation of fire line can also result in mortality by direct impact of wildlife by heavy equipment, or if small mammals become trapped in troughed fire lines and succumb to asphyxiation.

Conclusion – In general, this alternative would have negligible to minor, short-term, localized effects on terrestrial wildlife. The alternative would have negligible, adverse, localized impacts on

the Park's fisheries, as long as proper precautions (i.e. mitigation measures) are followed in the use of fire retardants during suppression efforts.

Impairment Determination - Implementation of this alternative would not significantly impact any wildlife or fisheries or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – The effects of suppressing human-caused fires and not utilizing prescribed fire are described under Alternative A. Suppressing human-caused fires which typically occur around VUA's would likely have minimal effects; these areas often do not provide significant wildlife habitat.

The effects of fire on wildlife are complex, with the potential for both adverse and beneficial effects. Effects can be direct, which typically are associated with individual survival or mortality, or indirect which are related to success. Wildlife employ a variety of techniques to survive a fire including remaining in burrows, moving into nonflammable areas such as wetlands, or lakes, or leaving the area entirely. They will also move into already burned areas, or take advantage of the fact that fires frequently burn in a mosaic pattern and move into unburned refuges. Direct mortality can occur when one of these techniques is not successful, and eggs or young are more likely to succumb than adults. Causes of direct mortality due to fire include asphyxiation, heat stress, burns, physiological stress, or trampling by other animals.

Indirect effects are more associated with improved or decreased survival and reproductive success which depends upon addressing needs for food, cover, movement, and social interactions. Fires can increase spatial complexity at the larger scale by increasing the amount of early successional communities, and overall patchiness and edge. In addition, spatial complexity is increased at the smaller scale through the creation of snags used by cavity nesters, perches valued by raptors, and downed logs and stream falls used by mink for travel corridors.

Cover is typically reduced immediately following fire which is related to increased predation for some species. However, vegetation in general returns quickly, often within a month or two and this lush growth is frequently sought out by several species of wildlife for its cover and food values. Browse is favored by deer, hares, and rabbits and bears benefit from the growth of herbs, grasses, and berries. Burned areas also support increased numbers of annual plant seeds which are attractive to several species of birds and small mammals such as deer mice. Other foods that typically increase following fires include insects which are attractive to black backed woodpeckers, deer mice, and bears alike.

Indirect effects are also related to changes in social interactions within and between species. A reduction in cover can increase competition for this valuable resource. Predator species often benefit from this and by increases in prey species attracted to various food sources.

By implementing wildland fire use, so that more acreage can be burned for resource benefits rather than initiating a suppression response, this alternative should make progress in the direction of restoring the ecological role of fire in Apostle Islands' natural communities. Several species of wildlife species should benefit by habitat changes and restored ecological niches that are likely to result, such the re-establishment of mosaics of differing age classes, vegetation communities, and successional stages.

Conclusion – Adverse disturbance effects to terrestrial wildlife should be negligible to minor, short-term, localized and no effects should have any measurable impacts to populations. Beneficial impacts could occur that were negligible to minor, and short-term to long-term, and localized. In general, the alternative would have negligible, adverse, localized impacts on the Park's fisheries, as long as proper precautions (i.e. mitigation measures) are followed in the use of fire retardants during suppression efforts.

Impairment Determination - Implementation of this alternative would not significantly impact any wildlife or fisheries or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – The effects of suppressing human-caused fires and not utilizing prescribed fire are the same as Alternative A. Suppressing human-caused fires which typically occur around VUA's would likely have minimal effects; these areas often do not provide significant habitat. Effects of fire are more complex and can be adverse or beneficial. Direct mortality can occur when animals are unable to escape, and young are more susceptible than adults. Indirect adverse effects that impact the likelihood of an individual surviving and successfully reproducing can result from the loss of vegetation which equates to reduced food and/or cover. Indirect beneficial effects occur when a given species is able to take advantage of conditions that follow fire such as increased availability of browse, and increased vegetative growth and fruiting.

The effects of prescribed fire are similar to, but less important than those described under Alternative B. This is because the amount of acreage proposed in wildlife habitat is comparatively small. The prescribed fires proposed on the Stockton Island tombolo should increase blueberry and huckleberry production for several years after implementation which would likely benefit bear and other wildlife in the area.

Conclusion – Effects to some species of terrestrial wildlife would be negligible, adverse, short-term, and localized. Other species would experience negligible to minor, beneficial, long-term, and localized effects. In addition, the alternative would have negligible, adverse, short-term, localized impacts on the Park's fisheries, as long as proper precautions (i.e. mitigation measures) are followed in the use of fire retardants during suppression efforts.

Impairment Determination - Implementation of this alternative would not significantly impact any wildlife or fisheries or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural

or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Cumulative Impacts - In the larger context, any number of projects and trends are underway, on geographic scales ranging from the region to the hemisphere, that affect the health and viability of wildlife populations in the Park. Some these trends are positive and some negative, and they concern such varied phenomena as different kinds of toxic contamination, habitat fragmentation in North America and habitat loss in South America (affecting neo-tropical migrants), and evolving attitudes toward wildlife. The cumulative effect of habitat changes in the park to date, after a century that included logging, fire suppression, and some wildfires, has been largely unfavorable to wildlife. Under Alternatives B or C, this pattern could begin to be reversed.

4.1.10 Wilderness

Methodology/Basis of Analysis
Impacts to wilderness character were evaluated qualitatively by examining the letter and spirit of the 1964 Wilderness Act, and the 1975 Eastern Wilderness Act, and professional judgment and experience.

Intensity

Negligible - A change in the wilderness character could occur, but it would be so small that it would not be of any measurable or perceptible consequence.

Minor - A change in the wilderness character and associated values would occur, but it would be small and, if measurable, would be highly localized.

Moderate - A change in the wilderness character and associated values would occur. It would be measurable, but localized.

Major - A noticeable change in the wilderness character and associated values would occur. It would be measurable, and would have a substantial or possibly permanent consequence.

Duration

Short-Term - Recovers in less than 1 year.

Long-Term - Takes more than 1 year to recover.

Extent

Localized – Impacts would affect wilderness only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect wilderness throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect wilderness on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A
Analysis – Under this alternative suppression actions to control wildfires could occur in wilderness. However, the use of Minimum Impact Suppression Techniques (MIST) within areas of recommended wilderness to minimize the effect of temporary human disturbances and intrusions

would be required. Minimum Impact Suppression Techniques could permit power tools in some circumstances and could be allowed in wilderness with approval of the Park Superintendent.

Suppression of human-caused fires would be less likely to impact wilderness values because of the tendency of these types of fires to occur around VUA's, locations frequently not associated with wilderness. Fires could occur along trails however, that are within wilderness. In these areas adverse impacts could be perceived by visitors immediately after fires in the form of burned forests and other communities.

This alternative would retain certain wilderness values – such as the appearance of wildness at most times and the absence of improvements and human inhabitants. Yet by actively excluding a critical natural force that shapes habitats and the landscape, Alternative A may be violating the spirit if not the letter of the Wilderness Act. In addition, the greater level of suppression activity that would occur under this alternative runs the risk of interfering both with the solitude and appearance of wilderness. There are no anticipated effects of not using prescribed fires on wilderness.

Conclusion – The effects of suppression would be negligible to minor, adverse, short-term, and localized.

Impairment Determination - The implementation of this alternative would not significantly impair wilderness or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – The effects of suppressing human-caused fires would be minimal on wilderness values because human-caused fires tend to occur in and around Visitor Use Areas, which are not associated with proposed wilderness.

Natural ignition of wildland fires is emphasized in this alternative, in keeping with the idea that natural forces should predominate in wilderness areas. Moreover, no prescribed fires would take place. Thus, this alternative not only preserves the appearance of wildness but would also allow freer rein for the forces of nature to operate unimpeded.

By allowing for greater wildland fire use over most of the Park, in a pure philosophical sense Alternative B would arguably comply most thoroughly with the intent of the Wilderness Act. Fire is a natural force, and thus wildland fire use is not deemed by National Park Service land managers as being inherently incompatible with wilderness character and values.

Conclusion - The effects of suppression would be negligible to minor, adverse and short-term. The effects of wildland fire use would be minor to moderate in a beneficial manner, long-term, and localized to local.

Impairment Determination - The implementation of this alternative would not significantly impair wilderness or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – The effects of suppressing human-caused fires are the same as those under Alternatives A and B. Effects would be minimal on wilderness values because human-caused fires tend to occur in and around Visitor Use Areas, which are not associated with proposed wilderness. The effects of managing lightning-caused fire were described under Alternative B. Natural ignition would take place which would allow natural forces to predominate. At the present time there are no prescribed fires proposed in proposed wilderness areas. Subsequently, there would be no effects of prescribed fire on the associated values at this time. In the future, prescribed fires could potentially be proposed in wilderness, which is allowed by National Park Service policy to restore natural conditions.

Conclusion - The effects of suppression would be negligible to minor, adverse, short-term, and localized. The effects of wildland fire use would be minor to moderate in a beneficial manner, long-term, and localized to local. The effects of prescribed fire would be negligible.

Impairment Determination - The implementation of this alternative would not significantly impair wilderness or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Cumulative Impacts – Wilderness was very recently designated in the Park. Impacts that the Park has faced and will continue to face include the influence of noise from a variety of sources, air pollution, and deposition of contaminants. In addition, vegetation communities have been modified through various land use practices. Implementation of any of the alternatives would not significantly compound these impacts. Allowing fire to function in a natural manner as outlined under Alternatives B or C would promote natural disturbance regimes, which is in line with wilderness character and values.

4.1.11 Soundscapes

Methodology/Basis of Analysis

Impacts from noise associated with fire management activities were evaluated qualitatively.

Intensity

Negligible - In areas where visitors frequent such as docks, campsites, and beaches, human-caused noise may be present much of the time during daylight hours. However, it is rarely audible between sunset and sunrise at distances more than 500 feet from the source. When noise is present, it is mostly at low levels. Visitors have opportunities to experience the natural soundscape free from human-caused noise frequently during the day, and almost

always between sunset and sunrise. In areas less visited, natural sounds predominate. Human-caused noise is rarely audible at 100 feet or more from the noise source. When noise is present, it is at very low levels and occurs only for short durations in most of the area. Visitors almost always have the opportunity to experience the natural soundscape free from human-caused noise.

Minor - In areas where visitors frequent such as docks, campsites, and beaches, human-caused noise may predominate during daylight hours, but for the majority of the time the noise is at low levels, and is only rarely at greater than medium levels. Human-caused noise is rarely audible between sunset and sunrise at 500 feet or more from the noise source. In areas less visited, natural sounds predominate. Human-caused noise is present only infrequently, and occurs only at low levels and for short durations in most of the area. Visitors have the opportunity to experience the natural soundscape free from human-caused noise most of the time in most of the area. Human-caused noise is rarely audible between sunset and sunrise at 100 feet or more from the noise source.

Moderate - In areas where visitors frequent such as docks, campsites, and beaches, human-caused noise predominates during daylight hours, but it is at medium or lower levels a majority of the time. Localized areas may experience human-caused noise at medium to high levels during half of the daylight hours. Human-caused noise is occasionally audible between sunset and sunrise at 500 feet or more from the noise source. In areas less visited, human-caused noise is present infrequently to occasionally, at low to medium levels and durations. At distances more than a mile from the shore, visitors have the opportunity to experience the natural soundscape free from human-caused noise almost all of the time. Human-caused noise is occasionally audible between sunset and sunrise at 100 feet or more from the noise source.

Major - In areas where visitors frequent such as docks, campsites, and beaches, human-caused noise predominates during daylight hours, and is at greater than medium levels a majority of the time that noise is present. Large areas may experience human-caused noise at medium to high levels during a majority of the daylight hours. Human-caused noise is often audible between sunset and sunrise at 500 feet from the noise source. In areas less visited, natural sounds commonly are masked by human-caused noise at low or greater levels for extended periods of time. More than a mile from the shore, the natural soundscape free from human-caused noise can be experienced less than half the time during the day. Human-caused noise is frequently audible between sunset and sunrise at 100 feet from the noise source.

Impairment Determination - In areas frequented by visitors, the natural soundscape would be impacted at major levels frequently or for extended periods of time in the majority of the area. Human-caused noise is frequently audible between sunset and sunrise at 500 feet from the noise source. The purpose and mission of the area in the Park can not be fulfilled.

Duration

Short-Term – Less than a day.

Long-Term – More than a day.

Extent

Localized – Impacts would affect soundscapes only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect soundscapes throughout the Park, but would not extend into the region outside.
Regional – Impacts would affect soundscapes on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

General Impacts

Fire suppression and prescribed fires could involve the use of motorized equipment that generates noise. In a national Park setting, noise often has the potential to impact both humans and wildlife. For humans, noise can affect recreational experiences and the enjoyment of wilderness values. For wildlife, noise may disrupt activities such as feeding, breeding, and nesting. This is of particular concern for threatened and endangered species.

In general, laboratory studies and limited field research to date have discovered four principal ways in which wildlife may be adversely affected by noise pollution:

- hearing loss, resulting from noise levels of 85 db or greater;
- masking, or the inability to hear important environmental cues and animal signals;
- non-auditory physiological effects, like increased heart rate, respiration, and general stress reaction; and
- behavioral effects, which vary widely between species and noise characteristics, resulting in, for instance, abandonment of territory and lost reproduction (Cornman 2001).

Noise disturbance is one of the primary impacts of both fixed-wing aircraft and helicopters sometimes used in fire suppression. With the use of helicopters, the potential for noise impacts increases, as flight frequency normally increases dramatically and missions expand to include landings.

Three of the principal noise-generating, motorized devices that could be used in each of the alternatives are chainsaws, helicopters and propeller aircraft. Chainsaws can reach 110 dB (Health & Safety Executive 2000), helicopters 105 dB, and propeller aircraft 120 dB (Roeser no date). While each of these devices exceeds the 85 dB threshold cited above, sound and noise are attenuated (reduced in intensity) with distance; both forest cover and uneven terrain accentuate the rate of sound attenuation (NYDEC 2001). Thus, at Apostle Islands, adverse effects on wildlife from the use of fire-related equipment are likely to be localized and temporary, and minor, although much more field research in the area of noise impacts on wildlife would be necessary to render a more definitive assessment. Noise per se is only part of the overall disturbance to which wildlife are subjected with the introduction of motors, human traffic, and fire itself into their habitat or nesting sites.

Noise calculations have been performed for mechanical and thinning activities using the Federal Highway Administration's Construction Noise Measurement, Prediction, and Mitigation methodology (FHA 1997). Noise level calculations were performed assuming that obstructions that may impede the propagation of sound (buildings, vegetation, etc.) were not present, and that the land between the source of the sound and the receiver was flat. Thus the noise level

calculations should be considered a "worst-case" measure. Based on the noise modeling calculations, ambient sound levels of about 45 dBA characteristic of wilderness or backcountry would be reached at a distance of approximately 5,000 feet (i.e. about one mile or 1.5 km) from the source of manual and mechanical thinning activities. Sound levels would be reduced even further if noise-generating activities occurred within dense vegetation, especially conifer forests. Dense vegetation that is at least 100 ft. deep would reduce the sound levels by 3 to 7 dBA (NYDEC 2000). Thus, ambient noise levels of 45 dBA could be reached within 2,500 ft. (about one-half mile or 0.8 km) of project operations with the previous assumptions.

Since wildland fire can occur virtually anywhere in the Park, the use of chainsaws, vehicles, planes and helicopters could also potentially occur anywhere in the Park under each of the alternatives below. However, at any given place within the Park, the use of this mechanized equipment would be very infrequent, on the order of hours, days, or at most weeks per decade. This is not frequent enough to substantially interfere with recreational human activities in the area or with wildlife behavior. Nor would such infrequent bursts of noise chronically impair the solitude and tranquility associated with wilderness.

Two other relevant factors in considering the impacts are: 1) the general paucity of "noise-sensitive receptors" (e.g. schools, hospitals, nursing homes, churches) within and adjacent to the national Park; and 2) the background noise from the engines of motorboats, aircraft, and snowmobiles in much of the Park. Apostle Islands does not possess a pristine acoustic environment, in spite of the generally wild landscape and wildlife this national Park protects. Relative to existing ambient noise levels, impacts from the alternatives below are rather inconsequential.

Steps can be taken to mitigate the impact of noise associated with fire suppression and fuels treatment at Apostle Islands. These measures are described in Chapter 2, under Mitigations.

Fuel treatments near the campgrounds and developed areas would be restricted to times of low visitor use of the Park to minimize and/or eliminate noise impacts on recreationists and visitors.

Alternative A

Analysis – The effects of suppression would be the same for either human or lightning-caused fires. In most years, the suppression activities under Alternative A would be minimal. If extreme weather conditions and fuel accumulation eventually triggered a large wildfire in the Park, a greater suppression effort would be undertaken with correspondingly greater noise levels.

Conclusion - Over the long-term, noise impacts from this alternative would be temporary, adverse, localized, and negligible to minor.

Impairment Determination - Implementation of this alternative would not significantly impair the soundscape and related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis - The effects of suppressing human-caused fires would be the same as those described under Alternative A, minimal in most years, and greater in years marked by more extreme weather conditions that allowed a large wildfire in the Park. Alternative B emphasizes the use of wildland fire use which would avoid the level of noise associated with suppression of lightning-caused fires.

Conclusion – Over the long-term, noise impacts from this alternative would be temporary, adverse, localized, and negligible to minor.

Impairment Determination -Implementation of this alternative would not significantly impair the soundscape and related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – The effects of suppressing human and lightning-caused fires were described under Alternative A, with minimal noise associated with suppression in most years and higher levels during rare years when larger, more intense fires occurred. The effects of managing lightning-caused fires are under Alternative B and would likely be minimal. Effects of noise associated with prescribed fires would be minimal. This is due to several reasons including timing of prescribed fires to occur during minimum visitation periods, the limited acreage of prescribed fires proposed in the EA, the size of individual burns, and the more likely use of chainsaws (110 DBA) than aircraft.

Conclusion - Over the long-term, noise impacts from this alternative would be temporary, localized, and negligible to minor.

Impairment Determination - Implementation of this alternative would not significantly impair the soundscape and related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents

Cumulative Impacts - Although there is not a constant level of artificial noise, passing motorboats, aircraft, and snowmobiles generate intermittent, motorized noise that impacts much of the Park on a regular basis during much of the year. Against this background, the potentially loud but localized and highly infrequent incidents of noise from fire management activities, including wildfire suppression, and prescribed fires, would not add significantly to the cumulative noise burden of Apostle Islands.

4.2 Cultural Resources

Methodology/Basis of Analysis

Impacts to cultural resources were assessed qualitatively by examining literature on the impact of fires and fire suppression on cultural resources and by discussions with cultural resource authorities.

Intensity

Negligible - Impact(s) is at the lowest levels of detection with neither adverse nor beneficial consequences. The determination of effect for §106 would be *no adverse effect*.

Minor - Adverse: alteration of a pattern(s) or feature(s) of the landscape would not diminish the overall integrity of the landscape. The determination of effect for §106 would be *no adverse effect*. **Beneficial:** preservation of landscape patterns and features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes.* The determination of effect for §106 would be *no adverse effect*.

Moderate - Adverse: alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for §106 would be *adverse effect*. A memorandum of agreement is executed among the National Park Service and applicable state or tribal historic preservation officer and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate. **Beneficial:** rehabilitation of a landscape or its patterns and features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The determination of effect for §106 would be *no adverse effect*.

Major - Adverse: alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for §106 would be *adverse effect*. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the National Park Service and applicable state or tribal historic preservation officer and/or Advisory Council are unable to negotiate and execute a memorandum of agreement in accordance with 36 CFR 800.6(b). **Beneficial:** restoration of a landscape or its patterns and features in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes*. The determination of effect for §106 would be *no adverse effect*.

Duration

Short-Term - Recovers in less than 1 year.

Long-Term - Takes more than 1 year to recover.

Extent

Localized – Impacts would affect cultural resources only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect cultural resources throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect cultural resources on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

General Effects

Management and protection of cultural resources within the Federal Wildland Fire Management Program is a complex process (Gleeson and Jones, 2000). At present, Federal land managers, including the NPS, USFS, BIA, BLM and USFWS, are working jointly to develop a comprehensive management strategy and Programmatic Agreement (PA) that is consistent with Section 106 of the Historic Preservation Act. The goal is to protect historic sites, structures, landscapes and traditional cultural sites while meeting fire management objectives

Many of the Park's cultural resources consist of structures made partly or entirely from wood. These range from the large, heavily visited wood-frame lighthouse on Raspberry Island, to the cluster of shacks comprising the Manitou Fish Camp, to the grown-over log foundations that mark the site of the Bear Island logging camp. These wooden structures are highly susceptible to damage by fire. The risk is increased by factors inherent in their location: many are located in the middle of forest, or in small clearings, highly exposed to spread of fire from surrounding wildlands. Moreover, the difficulty of access for fire-fighting personnel and equipment caused by their island situations means that prompt suppression is virtually impossible if a fire occurs. It is paradoxical but true at nearly all the Park's structures: if a fire begins, the building will burn to the ground, mere yards from the world's largest fresh-water supply.

The effects of fire on other cultural resources are still not well understood or documented. To date, much of the literature on the subject is anecdotal and qualitative (Gleeson and Jones, 2000), rather than based on controlled scientific studies. For example, post-fire observations are often unable to distinguish between damage to archeological resources caused by the fire itself from damage that was pre-existing. Thus, the following discussion of potential impacts of fire and fire management on cultural resources is of necessity general and somewhat speculative.

Both wildland fires and wildland fire suppression can affect cultural resources and historic properties. Fires themselves can and often do destroy historic structures or properties, especially those constructed of wood or other flammable material. Historic districts and cultural landscapes are also vulnerable to adverse impacts or destruction from wildfires.

The vulnerability of subsurface archeological resources and artifacts to fire depends not only on the nature of the materials themselves but on the depth of the object, the intensity of the fire, and on soil moisture. Hotter surface fires penetrate more deeply into the subsurface and can potentially cause more damage. Glass bottles can be cracked or broken for example. On the other hand, ceramics or objects carved or chipped from stone are likely to be more resistant to fire and heat. Surface scatters, especially items of wood, leather, or textile as often found at logging sites, are more vulnerable. Soil moisture reduces soil heating and also determines whether duff and litter will burn, which increases exposure to high temperatures. Since fires have occurred at Apostle Islands for centuries prior to the era of fire exclusion in the 20th century, some subsurface historic objects or archeological artifacts must have already withstood other fires to have survived to today.

Clearing fire lines associated with fire suppression can damage subsurface cultural and archeological resources by exposing, crushing, or removing them.

Apostle Islands' archeological and historical resources are nonrenewable; many are fragile as well. When disturbed or removed from their context, the scientific information they could furnish is often lost forever. Precautions would be taken during fire suppression and prescribed fire activities in the Park not to destroy or disturb important archeological and historical resources. A complete ground survey and inventory with detailed maps of sites, features, and environmental data are the best sources of cultural resources information for fire management planning; while archeological and historical site surveys in the Park are ongoing, they are still a long way from being completed. Only about one quarter of the Park's 42,160 land acres (17,060 ha) have been surveyed at even a minimal level.

Archeological sites, historic structures, and cultural landscapes are found throughout the Park, and will be protected during prescribed fires. The effect on ethnographic resources is difficult to predict; some may be beneficially impacted by prescribed fire, others adversely. However, during wildfires or escaped prescribed fires, all of these resources could be threatened. Mitigation measures for cultural resources were described in Chapter 2, under Mitigations.

Even though fires have occurred in the past and Indian tribes themselves once used fire, there are still potential impacts to ethnographic resources. Ethnographic places and landscapes may be negatively affected by each of the alternatives. Impacts to any given population of medicinal plants from any one prescribed fire could be moderate in intensity but localized in extent and temporary to short-term in duration. Like other native, fire-adapted plants, those of medicinal value would eventually re-establish themselves.

Alternative A

Analysis – Human-caused fires have the greater potential to be started near Visitor Use Areas, many of which overlap with, or are in close proximity to, cultural resources. Subsequently, there may be more potential for impacts to occur. As discussed above, cultural and archeological resources, especially undiscovered and unsurveyed ones, could be affected by fire, suppression, or rehabilitation; these impacts would be mitigated by the measures described in Chapter 2.

Various indigenous plants and animals with ethnographic attributes have probably been adversely affected by the last century of logging and fire exclusion, which has led to changes in plant communities and wildlife distribution and abundance.

Conclusion – In general, over the near to medium term of the next decade or two, Alternative A would result in negligible to minor, long-term, localized adverse effects to cultural resources.

Impairment Determination - Implementation of this alternative would not significantly impair cultural resources or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative B

Analysis – The effects of suppressing human and lighting caused fires were described under Alternative A. Alternative B would protect historic structures from fires being managed by

wildland fire use by placing fire suppression zones around them. Suppression zones were developed using GPS'd locations of cultural resources, which were mapped in GIS. These sites were then compared to fuel types and buffered for protection purposes. Fires being managed under wildland fire use would be suppressed at these boundaries.

It would be critical for fire management staff to keep the Park's Cultural Resource Management Specialist informed in advance of upcoming activities, so as to learn of any known cultural resources on or near the site of those activities, as well as any special concerns that are pertinent to the action at hand.

Conclusion - Over time, forces ranging from rust to erosion, microbial action, weathering, rainfall, oxidation, and vandalism all take their toll on the continued existence and integrity of archeological, historical, and cultural resources. Fire management can be conducted in such a manner as to protect known cultural resources like historic structures / properties and cultural landscapes and to minimize adverse effects on other resources such as undiscovered subsurface archeological artifacts. Effects would be expected to be negligible to minor, long-term, and localized.

Impairment Determination - Implementation of this alternative would not significantly impair cultural resources or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Alternative C

Analysis – The effects of fire suppression and managing lightning-caused fires were described in the previous two alternatives. The effects of prescribed fires on structures and artifacts would be minimal. This is because few cultural resources are found in proposed prescribed fire units, and any present would be identified before hand and protected during implementation. Cultural landscapes could benefit by being maintained by fire.

Conclusion - In general, over the near to medium term of the next decade or two, Alternative A would result in negligible to minor, long-term, localized adverse effects to cultural resources.

Impairment Determination - Implementation of this alternative would not significantly impair cultural resources or related values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of Apostle Islands National Lakeshore, (2) key to the natural or cultural integrity of the Park or opportunities its enjoyment, and (3) identified as a goal in the Park's General Management Plan or other National Park Service planning documents.

Overall Conclusion

By implementing the same mitigation measures, each of the alternatives would provide a degree of protection for historic and archeological resources, both known and undiscovered, that would likely be able to keep impacts from fire management activities to an acceptable minimum.

4.3 Socioeconomics

Methodology/Basis of Analysis

Impacts on socioeconomics were assessed qualitatively by examining socioeconomic and demographic data from the U.S. Census Bureau and then predicting the likely effects of wildland fires, prescribed fires, wildfires and fire suppression on socioeconomic factors. The area under consideration for this analysis is Ashland and Bayfield Counties.

Intensity

Negligible - Economic and socioeconomic conditions would not be affected, or effects would not be measurable.

Minor - The effect on economic and socioeconomic conditions would be small but measurable, and would affect a small portion of the population. Few effects could be discerned outside of the two-county area.

Moderate - The effect on economic and socioeconomic conditions would be readily apparent and widespread in the vicinity, with effects being evident at the two county level.

Major - The effect on economic and socioeconomic conditions would be readily apparent and would substantially change the economy or social services within the area.

Duration

Short-Term - Effects last one year or less.

Long-Term - Effects last longer than one year.

Extent

Localized – Impacts would affect socioeconomics only at the site of the fire, management action or suppression activity, or its immediate surroundings, and would not extend into the Park at large, or the region outside of the Park.

Local – Impacts would affect socioeconomics throughout the Park, but would not extend into the region outside.

Regional – Impacts would affect socioeconomics on a regional level, extending well past the immediate location of the fire, management action or suppression activity, and spreading into substantial portions of the Park and/or beyond its boundary.

Alternative A

Analysis - Both human and lightning-caused fires would be suppressed. Fire suppression would bring additional firefighters to the area temporarily, augmenting the workforce and economic activity, but these beneficial effects would be negligible overall. Less frequently, smoke would also drift into the gateway communities. Smoke from fires can mean a loss of tourism and associated revenues.

Conclusion – Impacts would be both adverse and beneficial, negligible, local to regional, and short-term.

Alternative B

Analysis – The effects of fire suppression activities on socioeconomics were outlined under Alternative A. Suppression of any type would bring fire fighters to the area and temporarily augment the local economy. The effects of wildland fire use would be similar, but less important, because there would still be a need for additional staffing to manage a lightning-

caused fire. Additionally, there is a potential for negative effects that could occur relative to smoke and tourism. It is expected however, that this would be minimal in most cases for several reasons. The amount of smoke produced is related in part to the size of the fire. The largest fire managed under wildland fire use that the Park could experience would equal the size of the largest island, which is Stockton Island. Stockton and Outer, the next largest island, are between 12-25 miles from the mainland. Prevailing winds would likely disperse smoke away from the Mainland.

Conclusion - Impacts would be both adverse and beneficial, negligible, local to regional, and short-term.

Alternative C

Analysis – Alternatives A and B discussed the effects of suppression and managing wildland fire use on socioeconomics. Suppression of any type would bring fire fighters to the area and temporarily augment the local economy. Effects would be minimal because of the short-term nature of most fire suppression actions. Managing wildland fire has the potential to also bring in additional staff which could also have a beneficial effect to the local economy. Smoke could periodically impact tourism related to visualizing the islands, although it is likely that prevailing winds would result in dispersal.

The effects of prescribed fire would be minimal to none due to the very small area under consideration for this EA and the small amount likely to be burned in any given year. In addition, prescribed fires are frequently completed within a few days which would also minimize impacts. Periodic exposure to smoke could occur during prescribed fires, but this would be addressed by completing fires in the spring and fall, not during peak tourist season.

Conclusion - Impacts would be both adverse and beneficial, negligible, local to regional, and short-term.

Cumulative Impacts - As stated at the outset of this section, cultural resources are limited and non-renewable and many are fragile. Over time, forces ranging from rust to erosion, microbial action, weathering, rainfall, oxidation, and vandalism all take their toll on the continued existence and integrity of archeological, historical, and cultural resources. Fire management can be conducted in such a manner as to protect known cultural resources like historic structures / properties and cultural landscapes and to minimize adverse effects on other resources such as undiscovered subsurface archeological artifacts.

4.4 Human Health and Safety

Methodology/Basis of Analysis

Impacts on human health and safety were assessed qualitatively by examining information on land use patterns and then predicting the likely effects of wildland fires, wildfires and fire suppression on human health and safety.

Intensity

Negligible - Public health and safety would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on the public health or safety.
Minor - The effect would be detectable and would likely be short-term, but would not have an appreciable effect on public health and safety. If mitigation were needed, it would be relatively simple and would likely be successful.
Moderate - The effects would be readily apparent and long-term, and would result in substantial, noticeable effects to public health and safety on a local scale. Mitigation measures would probably be necessary and would likely be successful.
Major - The effects would be readily apparent and long-term, and would result in substantial, noticeable effects to public health and safety on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

Duration

Short-Term - Effects last one year or less.
Long-Term - Effects last longer than one year.

Alternative A

Analysis – Potential health and safety impacts to both members of the public and firefighters include smoke inhalation and direct injuries from fires. Firefighters face additional issues with the potential for direct injuries from fighting fire, and associated equipment including retardant. Fire fighters must be qualified as certified by a "red card" and will receive safety briefings.

Federal wildland fire policy now requires that all fire management activities consider safety of personnel and the public as the highest priority. Consequently, Apostle Islands National Lakeshore has adopted measures to ensure this. These measures would be followed under each alternative in this EA. The Fire Management Officer will inform other divisions of all potentially hazardous natural or prescribed fires in the Park. The Chief of Planning and Resource Management will then coordinate public notification efforts within and outside the Park. The extent of public notice will depend on the specific fire situation. The information actions to be considered:

- Initial attack/monitoring/burn team members will determine the proximity of visitors and neighbors to the fire, inform them of potential hazards, and aid in their evacuation if necessary.
- When a wildland fire is in progress, information listing location, fire behavior, expected dangers, areas to avoid, and precautions will be posted on Park bulletin boards, the Park web page, and at visitor centers. Interpretative specialists will inform the public of dangers as well as interpret the role of fire in natural areas.
- When the hazards from a wildland fire are high, signs on trails leading into the fire activity area will be posted. Trails, campsites, day use sites, and cabin sites will be closed if deemed necessary by the Fire Management Overhead Team, and as approved by the Superintendent. The Prescribed Burn Boss will ensure that closure and/or informational signs on prescribed fires are properly posted.
- Visitor use will be limited or prevented near wildland fires and potentially affected areas. National Park Service personnel will patrol the perimeter of fires burning along the Park to inform visitors and neighbors about the role of fire in a natural area, explain the risks associated with approaching too close to a fire, and enforce visitor compliance with area closure orders.

- A Wildland Fire Status Summary will be kept by the Park Dispatcher. Crews and teams will be kept informed of the status of ongoing fires by the use of a daily Wildland Fire Status Summary broadcast on the NPS web page after the morning fire weather forecast. This status summary will also be distributed to all Park divisions on a daily basis and posted on the Park web page.
- News articles will be written and released to local newspapers, radio, and television stations as well as posted on the Park web page.
- The Park information line will be updated by the Park Dispatcher whenever new information is available on fires in progress.
- The Fire Management Officer will notify the following agencies of government about fire activities in the Park: Ashland and Bayfield County Sheriffs, Federal Aviation Administration, National Weather Service, MDNR, and Chequamegon National Forest.
- Burned areas will be posted at campsites, day use sites, and trailheads if potential hazards exist. Campsites, day use sites, and trailheads will remain closed until all hazard trees are removed from the vicinity of the site. The public will be informed of hazards and appropriate safety precautions associated with traveling through or camping in burned areas.

Conclusion - Overall, during most years, Alternative A would have negligible, short-term adverse effects on human health and safety. It should be recognized that the wildfire suppression function alone confers benefits to the health and safety of residents, visitors and Park staff.

However, over the long-term, and probably well beyond the lifetime of the Fire Management Plan, the rare but destructive fires that this alternative could help foster could have moderate to major effects, some positive and some negative, on the health and safety of Park staff, firefighters, visitors and the residents of surrounding communities.

Alternative B

Analysis – This alternative would suppress all human-caused fires, manage lightning-caused fire, and would not complete any prescribed fires. The effects of suppressing fires would be the same as those described for Alterative A, and there are no immediate effects of not implementing prescribed fires. The practices identified under Alternative A to minimize effects would also be implemented under managing wildland fire use.

Conclusion - Overall, during most years, Alternative B would have negligible, adverse, short-term effects on human health and safety. It should be recognized that the wildfire suppression function alone confers major benefits to the health and safety of residents, visitors and Park staff.

Alternative C

Analysis – This alternative would suppress all human-caused fires, manage lightning-caused fires, and would implement prescribed fires on approximately 600 acres. The effects of suppressing fires, and wildland fire use were described under alternative B. The practices identified under Alternative A to minimize effects would also be implemented before and during prescribed fires. The effects of implementing prescribed fires would be similar to those for managing wildland fire.

Conclusion - Overall, during most years, Alternative C would have negligible, short-term adverse effects on human health and safety. It should be recognized that the wildfire suppression function alone confers major benefits to the health and safety of residents, visitors and Park staff.

Cumulative Impacts – No cumulative impacts are anticipated from implementing any of the alternatives.

4.5 Visitor Use and Experience

Methodology/Basis of Analysis

Impacts to visitor use and experience were assessed qualitatively by using professional judgment and experience, as well as discussions with Park officials to predict the likely effects of wildland fires, wildfires and fire suppression on visitors, based on known features and characteristics of fire suppression, management of wildland fire use.

Intensity

Negligible - Visitors would not be affected or changes in visitor use and/or experience would be below or at the level of detection. Any effects would be short-term. The visitor would not likely be aware of the effects associated with the alternative.

Minor - Changes in visitor use and/or experience would be detectable, although the changes would be slight and likely short-term. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.

Moderate - Changes in visitor use and/or experience would be readily apparent and likely long-term. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.

Major - Changes in visitor use and/or experience would be readily apparent and have important long-term consequences. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

Duration

Short-Term - Effects last 1 year or less.

Long-Term - Effects last longer than 1 year.

General Effects

Three principal kinds of impacts would occur with regard to visitor use and experience: smoke, the appearance of burned areas, and closures. The first is invariably negative, but can be minimized by conducting prescribed fires during the spring and fall, thereby avoiding the summer peak visitation period. It can also be mitigated by measures discussed in the air quality section (primarily, trying to burn when wind would blow the smoke away from areas with large numbers of visitors) and the FMP's program of public information and education below.

With regard to the second impact on visitor experience – the sight of burned areas – to the visitor uninformed about the "new" understanding of fire's role in the ecology of the Apostle Islands' landscape, a recently burned forest, even one touched lightly primarily on the ground by prescribed fire or wildland fire use appears to have been damaged or destroyed. This adverse

impact on visitor experience can be substantially mitigated through education. Furthermore, vegetation often returns quickly after a fire and is often considered by many to be very appealing.

Disseminating information about fire's natural role and effects is an important step in establishing public support for such programs. Apostle Islands' wildland fire management information program used under all alternatives would be factual, straightforward, and aimed at many different audiences. The following guidelines would be followed:

Prior to fire activities:

- Ecological concepts upon which the wildland fire management program is based will be incorporated into information handouts, selected books written about the Park, and wayside and visitor center exhibits.
- The Park will work with Eastern National to make sure that relevant, factually accurate sales publications that address fire's role in natural areas are available at its sale outlets in the Park.
- The fire management program will be incorporated into appropriate interpretative talks, walks, the Park newspaper, the Park map and guide , the Park camping brochure, site bulletins, bulletin board signs, and temporary exhibits at Park visitor centers . Particular attention will be given to these activities when fires are conspicuous from visitor centers and/or local communities.
- Articles will also be written about Apostle Islands' fire management program and released for publication in statewide, regional, and national periodicals.
- The wildland fire management program will be discussed in informal contacts between staff from all divisions and Park concessionaires, special use permittees, Park neighbors, and Park visitors.
- To effectively answer visitor questions, every NPS and concession employee in the Park will be made aware of the wildland fire management program and the status of ongoing fires.

During fire activities:

- The Chief of Interpretation and Education will be kept informed daily by the Fire Management Officer of management actions, and the status of fires in the Park.
- Information handouts explaining the fire management program will be prepared and periodically updated. During periods when management fires are burning, these handouts will be distributed to visitors at Park visitor centers and by NPS field personnel during informal contacts out in the Park.
- News articles will be written and released to local newspapers, radio, and television stations.
- Public information outlets for neighboring land management agencies will be provided with fire management information.
- Signs notifying the public about ongoing wildland fire use, prescribed fires, and wildfires, area closures, dense smoke, or other special situations will be placed along

roadways, at visitor centers, bulletin boards, boat launching ramps, local marinas, trailheads, campsites, day use sites, cabin sites, and at resorts.

Alternative A

Analysis – This alternative would suppress all human and lightning-caused fires, and prescribed fires would not be completed.

In most years, impacts on visitor use and experience would likely be temporary, localized in extent and minor in magnitude. However, larger wildfires could occasionally occur. At these times, impacts on visitor use and experience could be greater.

Area closures would occur to a limited extent under this alternative, inconveniencing some visitors and preventing recreation in some sites temporarily. Generally, this impact would be temporary, localized and minor to moderately adverse. Visitor reaction can be improved by education and information about the Park's fire management program.

Since no prescribed fire would be conducted, no impacts on visitors from smoke, closures, and the sight of recently burned units would occur.

Conclusion – Impacts to visitor use would be negligible to minor, adverse, and short-term.

Alternative B

Analysis – The effects of suppression and not implementing prescribed fire were described under Alternative A. Visitor education would take place prior to and during fire activities. Temporary closures could be possible, as could auditory and visual impacts.

Alternative B would allow wildland fire use as a management option. Visitors could be temporarily impacted by closures, and by being able to see and potentially smell smoke on an island under this alternative. These impacts would last for the length of time the wildland fire use is in progress. It is also possible that visitors would be impacted after a wildland fire use was finalized by the appearance of an area. This would likely last for a few weeks up to a few months until the area revegetated.

Conclusion – The effects would be negligible to minor, adverse, and short-term.

Alternative C

Analysis –The effects of fire suppression and not implementing prescribed fire were described under alternative A. Visitor education would take place prior to and during fire activities. Temporary closures could be possible, as could adverse visual impacts. Effects of managing wildland fire use could include closures for the duration of the action as well as auditory and visual impacts.

This alternative adds prescribed fire as a management option. Effects to visitor use would be minimal because prescribed fires would most likely be completed during the spring and fall, when visitation is at lower levels.

Conclusion - Impacts to visitor use would be negligible to minor, adverse, and short-term.

Cumulative Impacts – No cumulative effects would be anticipated on visitor use and experience by implementing any of the alternatives.

Based on this analysis, Wildland Fire Use and Prescribed Fire Use (Alternative C) is proposed as the preferred management alternative for Apostle Islands National Lakeshore.

APPENDIX A

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APPENDIX B

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ARPA	Archaeological Resources Protection Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
CWD	Coarse Woody Debris
dB	Decibel
dBA	A-weighted Decibel
DDE	Dichlorodiphenyltrichloroethane
DNR	Department of Natural Resources
DO	Director's Order
DOI	Department of the Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FM	Forest Maintenance
FMP	Fire Management Plan
FMU	Fire Management Unit
FMA	Fire Management Area
FR	Forest Replacement
FONSI	Finding of No Significant Impact
FR	Federal Register
FRF	Forest Replacement Fire
FY	Fiscal Year
GIS	Geographic Information Systems
GMP	General Management Plan
ha	Hectares
HSA	Historic Sites Act
ICS	Incident Command System
km	Kilometers
LCS	List of Classified Structures
LIF	Light Intensity Fire

m	Meters
mph	Miles Per Hour
MIST	Minimum Impact Suppression Techniques
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NCAR	National Center for Atmospheric Research
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NAGPRA	Native American Graves Protection and Repatriation Act
NIEHS	National Institute of Environmental Health Sciences
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PCB	Polychlorinated Biphenyls
P.L.	Public Law
PM	Particulate Matter
PM_{10}	Particulate Matter smaller than 10 microns in diameter
$PM_{2.5}$	Particulate Matter smaller than 2.5 microns in diameter
RMP	Resource Management Plan
ROD	Record of Decision
SM	Savanna Maintenance
SMP	Smoke Management Plan
SHPO	State Historic Preservation Officer
TNC	The Nature Conservancy
USCB	United States Census Bureau
USEPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VUA	Visitor Use Area
VOC	Volatile Organic Compound
WFU	Wildland Fire Use

APPENDIX C

GLOSSARY

Air Quality*:* The characteristics of the ambient air (all locations accessible to the general public) as indicated by concentrations of the six air pollutants for which national standards have been established, and by measurement of visibility in mandatory Federal Class II areas.

Ambient Air: Any unconfined portion of the atmosphere; open air, surrounding air.

Ambient Air Quality Standards: Standards established on a state or Federal level that define the limits for airborne concentrations of designated "criteria" pollutants (e.g., nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter, ozone, lead) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Archaeological Resources: Any material of human life or activities that is at least 100 years old, and that is of archaeological interest.

Attainment Area: An area considered to have air quality as good as or better than the National Ambient Air Quality Standards as defined in the Clean Air Act. An area may be an attainment area for one pollutant and a non-attainment area for others. Attainment areas are defined using pollutant limits set by USEPA.

Best Management Practice (BMP): A practice or combination of practices chosen as the most effective, economical, and practical means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with state and local water quality goals. Selection of appropriate BMPs depends largely upon the conditions of the site, such as land use, topography, slope, water table elevation, and geology.

Burning Index A number related to the contribution that fire behavior makes to the amount or effort needed to contain a fire in a specified fuel type within a rating area.

Cuspate Foreland - An accretion of sand which has been molded by longshore drift and constructive waves emanating from two different directions.

Confine – Confinement is the strategy employed in appropriate management responses where a fire perimeter is managed by a combination of direct and indirect actions and use of natural topographic features, fuel, and weather factors.

Combustion: Burning. Many important pollutants, such as sulfur dioxide, nitrogen oxides, and particulates (PM-10) are combustion products, often products of the burning of fuels such as coal, oil, gas and wood

Coniferous: Cone-bearing tree. Examples are pines, firs, spruces, hemlocks, and cedars.

Criteria air pollutants: A group of y common air pollutants regulated by EPA on the basis of criteria (information on health and/or environmental effects of pollution) and for which NAAQS have been established. In general, criteria air pollutants are widely distributed over the country. They are: particulate matter (PM), carbon monoxide(CO), sulfur dioxide(SO_2), ozone(0_3), and lead.

Cultural Landscape: A geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. There are four general kinds of cultural landscapes, not mutually exclusive: historic sites, historic designed landscape, historic vernacular landscape, and ethnographic landscape.

Cultural Resources: Any building, site, district, structure, object, data, or other material significant in history, architecture, archeology, or culture. Cultural resources include: historic properties as defined in the National Historic Preservation Act (NHPA), cultural items as defined in the Native American Graves Protection and Repatriation Act (NAGPRA), archeological resources as defined in the Archeological Resources Protection Act (ARPA), sacred sites as defined in Executive Order 13007, *Protection and Accommodation of Access To "Indian Sacred Sites,"* to which access is provided under the American Indian Religious Freedom Act (AIRFA), and collections.

Deciduous: Shedding leaves annually. Deciduous trees tend to be broad-leafed, such as oaks, maples, birches, and aspens. However, the larch, which is a needle-bearing, coniferous tree, is also deciduous.

Demography: The statistical science dealing with the distribution, density, vital statistics, etc. of populations.

Endangered Species: A species of plant or animal that is in danger of extinction throughout all or a significant portion of its range.

Ethnography: Part of the discipline of cultural anthropology concerned with the systematic description and analysis of cultural systems or lifeways, such as hunting, agriculture, fishing, other food procurement strategies, family life festivals and other religious celebrations.

Federal Land Manager (FLM): With respect to any lands in the United States, the Secretary of the Federal department with authority over such lands. Generally, the Secretaries delegate their authority to specific elements within each department. For example, the National Park Service and the Fish and Wildlife Service manage those areas under the authority of the Department of the Interior.

Fire Management Plan (FMP): A strategic plan that defines a program to manage wildland and prescribed fires, and documents strategies designed to meet management objectives outlined in the approved resource management plan. The plan is supplemented by operational procedures such as preparedness plans, burn plans, and prevention plans.

Fire-Dependent Ecosystem: A community of plants and animals that must experience recurring disturbances by fire in order to sustain its natural plant succession, structure and composition of vegetation, and maintain appropriate fuel loading and nutrient cycling to ensure proper ecosystem function.

Fire Regime – Periodicity and pattern of naturally-occurring fires in a particular area or vegetative type, described in terms of frequency, biological severity, and areal extent.

Fire Use: The combination of wildland fire use and prescribed fire application to meet resource objectives.

Fixed-Wing Aircraft: Floatplane or ski plane-configured aircraft.

Fuel: Includes combustible vegetative matter such as grass, trees, shrubs, limbs, branches, duff, and stumps.

General Management Plan (GMP): A document that sets forth a basic management philosophy and a framework for decision-making for each unit of the National Park System, such as Apostle Islands National Lakeshore, for a period of 15-20 years.

Geological Formation: Layers of rock, deposited in the same geological age and forming a distinctive unit.

Groundwater: Water in porous rocks and soils of the earth's crust; a large proportion of the total supply of fresh water.

Hardwoods: Broad-leaf trees that are usually deciduous and tend to have harder wood than conifers. Includes oaks, maples, hickories, ashes, birches, aspens, and poplars.

Hazardous Materials: Solid or liquid materials which may cause or contribute to mortality or serious illness by virtue of physical and chemical characteristics, or pose a hazard to human health or the environment when improperly managed, disposed of, treated, stored, or transported.

Haze: An atmospheric aerosol of sufficient concentration to be visible. The particles are too small to see individually, but reduce visual range by scattering light.

Intermittent Stream: A stream that flows only at certain times of the year when it receives water from rainfall, surface runoff, or springs.

Interpretation: A communication process designed to reveal meanings and relationships of cultural and natural heritage to the public through first-hand experiences with objects, artifacts, landscapes or sites; facilitating a connection between the interests of the visitor and the meaning of the Park by explaining the Park's purpose and significance; usually a single contact with a group or individual.

List of Classified Structures (LCS) – The National Park Service inventory of all historic structures that are currently on or have been determined eligible for the National Register or that are ineligible for the National Register but have been determined through the planning process to be managed as resources in which the National Park Service maintains a defensible legal interest.

Land Use Plan: A broad scale, long range plan (e.g., forest plan, refuge plan or resource management plan) that identifies the scope of actions and goals for the land and resources administered by a land owner/manager.

Loam: A soil material which contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Median Income: The amount which divides the income distribution of a given area into two equal groups, half having incomes above the median, half having incomes below the median.

Mitigation Actions - Mitigation actions are considered to be those on-the-ground activities that will serve to increase the defensibility of the MMA; check, direct, or delay the spread of fire; and minimize threats to life, property, and resources. Mitigation actions may include mechanical and physical non-fire tasks, specific fire applications, and limited suppression actions. These actions will be used to construct firelines, reduce excessive fuel concentrations, reduce vertical fuel continuity, create fuel breaks or barriers around critical or sensitive sites or resources, create "blacklines" through controlled burnouts, and to limit fire spread and behavior.

Monitoring (monitor): Systematically observing, recording, or measuring some environmental attribute, such as air quality or water quality, or ascertaining compliance with a given law, regulation, or standard. For example, measurement of air pollution is referred to as monitoring. The Environmental Protection Agency, and state and local agencies measure the types and amounts of pollutants in the ambient air. The 1990 Clean Air Act requires certain large polluters to perform enhanced monitoring to provide an accurate picture of how much pollution is being released into the air. The 1990 Clean Air Act requires states to monitor community air in polluted areas to check on whether the areas are being cleaned up according to schedules set out in the law.

Municipal: Belonging to a corporation or city.

National Environmental Policy Act (NEPA): Establishes procedures that Federal agencies must follow in making decisions on Federal actions that may impact the environment. Procedures include evaluation of environmental effects of proposed actions, and alternatives to proposed actions, involvement of the public and cooperating agencies.

National Ambient Air Quality Standards (NAAQS): Standards for maximum acceptable concentrations of "criteria" pollutants in the ambient air to protect public health with an adequate margin of safety (primary standard), and to protect public welfare from any known or anticipated adverse effects of such pollutants (e.g., visibility impairment, soiling, materials damage, etc.) in the ambient air (secondary standard).

National Fire Danger Rating System (NFDRS) – A multiple index scheme designed to provide fire control and land management personnel with a systematic means of assessing various aspects of fire danger on a day-to-day basis.

Natural Resources: Phenomena that occur in their natural state - wildlife, fisheries, water, forests, air, soils, minerals, and the systems and processes that maintain them.

Non-attainment Area: A geographic area that has been designated by the U.S. Environmental Protection Agency and the appropriate state air quality agency as exceeding one or more National Ambient Air Quality Standards. It has been estimated that 60% of Americans live in nonattainment areas.

Nonpoint Source: A source of pollution that is inherently diffuse or dispersed, such as land runoff, precipitation, atmospheric deposition, or percolation.

Ozone: A gas that is a variety of oxygen. Ozone consists of three oxygen atoms stuck together into an ozone molecule. Ozone occurs in nature; it produces the pungent odor smelled near a lightning strike. High concentrations of ozone occur in a layer of the atmosphere -- the stratosphere -- high above the Earth. Stratospheric ozone shields the Earth from harmful rays from the sun, particularly ultraviolet B. Smog's main component is ozone; this ground-level or tropospheric ozone is a product of reactions among chemicals produced by burning coal, gasoline and other fuels, and chemicals found in products including solvents, paints, hair sprays, etc.

Parent Material: Disintegrated and partly weathered rock from which soils are formed.

Particulate Matter (PM): A mixture of very small particles that are suspended in the atmosphere, except uncombined water, which exists as a solid or liquid at standard conditions (e.g., dust, smoke, mist, fumes, or smog).

PM_{10}: Particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers (including $PM_{2.5}$). Concentrations in the air are measured as micrograms per cubic meter of air (ug/m3).

$PM_{2.5}$: Particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers. Concentrations in the air are measured as micrograms per cubic meter of air (ug/m3).

Perennial Stream: A stream that flows throughout the year.

Poverty: Per the Office of Management and Budget's Directive 14, the U.S. Census Bureau uses a set of money income thresholds that vary by family size and composition to detect who is poor. If a family's income is less than the threshold for that family, then that family, and every individual in it, is considered poor. Poverty thresholds do not vary geographically; however, they are updated annually for inflation with the Consumer Price Index. The official poverty definition counts money income before taxes and excludes capital gains and noncash benefits, such as housing, Medicaid, and food stamps.

Prescribed Fire: Any fire ignited by management actions to meet specific objectives (i.e., managed to achieve resource benefits).

Prescription: Measurable criteria that guide selection of appropriate management response and actions. Prescription criteria may include the meteorological conditions affecting the area under prescription, as well as factors related to the state of the area to be burned such as the fuel moisture condition and other physical parameters. Other criteria which may be considered include safety, economic, public health, environmental, geographic, administrative, social or legal considerations, and ecological and land use objectives.

Preservation: The act or process of applying measures necessary to sustain the existing form, integrity and materials of a historic structure, landscape, or object; generally is ongoing in nature involving repairs rather than extensive replacement and new work.

Proposed Wilderness: land recommended for designation as wilderness by Congress, based on a wilderness study submitted by a Park or region, but which has not been approved by the Department and subsequently transmitted to Congress by the President; managed so as to not diminish wilderness characteristics.

Regional Haze: Generally, concentrations of fine particles in the atmosphere extending hundreds of miles across a region and causing deteriorated visibility conditions; wide-spread visibility impairment, especially in mandatory Class I Federal areas where visibility is an important value.

Resource Management Plan (RMP): A document prepared for a given unit of the National Park System, such as Apostle Islands National Lakeshore, that sets forth goals, issues and strategies for the management, conservation and protection of natural and cultural resources at that unit.

Runoff: Non-infiltrating water entering a stream or other conveyance channel during and shortly after a rainfall.

Scoping: Planning process that solicits people's and "stakeholders'" opinions on the value of a Park, issues facing a Park, and the future of a Park. Also used in the NEPA process at the outset of preparing an EA or an EIS to help determine the scope of the study and the major issues that merit investigation and analysis.

Sensitive Populations: Those populations to whom smoke may present particular health risks

Sensitive Receptors: Locations where human population tend to concentrate and where smoke could impact the health of those population or significantly impact visibility that may be detrimental to either health or the enjoyment of scenic qualities of the landscape. These may be residential concentrations in the form of towns or cities, or locations where people tend gather in groups such as Parks. Travel routes such as highways may be labeled as sensitive receptor sites where smoke can be a factor in potential motor vehicle accidents. Particular areas along

highways or other locations may be more prone to being declared sensitive receptor sites because of topographic and microclimate features.

Silt: Fine sediment suspended in stagnant water or carried by moving water; it often accumulates on the bottom of streams and rivers.

Smoke Management Program: Establishes a basic framework of procedures and requirements for managing smoke from fires that are managed for resource benefits. The purposes of SMP's are to mitigate the nuisance and public safety hazards (e.g., on roadways and at airports) posed by smoke intrusions into populated areas; to prevent deterioration of air quality and NAAQS violations; and to address visibility impacts in mandatory Class I Federal areas in accordance with the regional haze rules.

Soil Association: A landscape, named for its major soil types, that has a distinctive proportional pattern of soils, generally consisting of one or more major soils and at least one minor soil type.

Soil Erosion: The removal and loss of soil by the action of water, ice, gravity, or wind.

Source: Any place or object from which pollutants are released. A source can be a power plant, factory, dry cleaning business, gas station or farm. Cars, trucks and other motor vehicles are sources, and consumer products and machines used in industry can be sources too. Sources that stay in one place are referred to as stationary sources; sources that move around, such as cars or planes, are called mobile sources.

Southern Transitional Boreal Forest: Mixed vegetation community areas of the Park that lie between Great Lakes northern hardwood forests and conifer-dominated boreal forests to the north.

State Historic Preservation Officer (SHPO): The official within each state, authorized by the state at the request of the Secretary of the Interior, to act as a liaison for purposes of implementing the NHPA.

State Implementation Plan (SIP): A detailed description of the programs a state will use to carry out its responsibilities under the *Clean Air Act*. State implementation plans are collections of the regulations and emission reduction measures used by a state to reduce air pollution in order to attain and maintain NAAQS or to meet other requirements of the Act. The Clean Air Act requires that EPA approve each state implementation plan. Members of the public are given opportunities to participate in review and approval of state implementation plans.

Stationary Source: A place or object from which *pollutants* are released and which does not move around. Stationary sources include power plants, gas stations, incinerators, etc.

Suppression: A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

Threatened Species: A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Use and Occupancy: Owners of improved property on the date of NPS acquisition may retain use and occupancy rights for noncommercial residential purposes for a period not to exceed 25 years or life, whichever is later.

Violation of the PM NAAQS: As revised in 1997, the daily PM_{10} standard is violated when the 99th percentile of the distribution of 24-hour concentrations for a period of 1 year (averaged over 3 calendar years) exceeds 150 $\mu g/m^3$ at any monitor within an area. The annual PM_{10} standard is violated when the arithmetic average of 24-hour concentrations for a period of 1 year (averaged over 3 calendar years) exceeds 50 $\mu g/m^3$ at any monitor within an area. For PM2.5the daily standard is violated when the 98th percentile of the distribution of the 24-hour concentrations for a period of 1 year (averaged over 3 calendar years) exceeds 65 $\mu g/m^3$ at any monitor within an area. The annual standard is violated when the annual arithmetic mean of the 24-hour concentrations from a network of one or more population-oriented monitors (averaged over 3 calendar years) exceeds 15 $\mu g/m^3$.

Visit: One person visiting a site or area for recreation purposes for any period of time.

Visitor Destination: Point of interest in the Park established for day use visitation.

Volatile Organic Compounds (VOC's): Any organic compound that participates in atmospheric photochemical reactions. Some compounds are specifically listed as exempt due to their having negligible photochemical reactivity. [See 40 CFR 51.100.] Photochemical reactions of VOC's with oxides of nitrogen and sulfur can produce O_3 and PM.

Wetlands: Areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil, including swamps, marshes, bogs, and other similar areas.

Wilderness: According to the Wilderness Act of 1964, "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Furthermore, it "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."

Wilderness Recommendation: The document resulting from the process to determine the suitability of all lands and waters within Apostle Islands National Lakeshore for wilderness designation.

Wildfire: An unwanted wildland fire.

Wildland Fire: Any non-structural fire, other than prescribed fire, that occurs in a wildland. Note: Wildland fires include unwanted (wild) fires and naturally-ignited fires that are managed within a prescription to achieve resource benefits.

Wildland Fire Suppression: An appropriate management response to wildland fire that results in the curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

Wildland Fire Use: The management of naturally-ignited wildland fires to accomplish specific pre-stated resource management objectives in pre-defined geographic areas as outlined in fire management plans. Operational management is described in the Wildland Fire Implementation Plan (WFIP). Wildland fire use is not to be confused with "fire use," which is a broader term encompassing more than just wildland fires..

Wildland/Urban Interface: The line, area or zone where structures and other human development meet or intermingle with wildlands.

Wildland: An area where development is generally limited to infrequent roads, railroads, utility corridors, and widely-scattered structures. The land is not cultivated (i.e., the soil is disturbed less frequently than once in 10 years), is not fallow, and is not in the United States Department of Agriculture (USDA) Conservation Reserve Program. The land may be neglected altogether or managed for such purposes as wood or forage production, wildlife, recreation, wetlands or protective plant cover. It may be publicly or privately-owned.

APPENDIX D

ENVIRONMENTAL LAWS AND REGULATIONS

Relevant Laws and Regulations	Summary	Affected Resource(s)
National Environmental Policy Act (NEPA) (42 USC 4321-4370)	Requires Federal agencies to evaluate the environmental impacts of their actions and to integrate such evaluations into their decision-making processes.	All
Council on Environmental Quality (CEQ) Regulations	These regulations (40 CFR 1500-1508) implement NEPA and establish two different levels of environmental analysis: the environmental assessment (EA) and the environmental impact statement (EIS). An EA determines whether significant impacts may result from a proposed action. If significant impacts are identified, an EIS is required to provide the public with a detailed analysis of alternative actions, their impacts, and mitigation measures, if necessary.	All
Antiquities Act (AA) (16 USC 431 et seq.)	Authorizes the President to designate as national monuments any historic landmarks and historic and prehistoric sites, structures, and objects situated on Federal land. Establishes the requirement of a permit for the examination or excavation of such nationally important sites and establishes penalties for their destruction.	Cultural Resources
Archaeological Resources Protection Act (ARPA) (16 USC 470a et seq.)	Ensures the protection and preservation of archeological resources on Federal lands.	Cultural Resources
Clean Air Act (CAA) (42 USC 7401 et seq.)	Among its varied provisions, the CAA establishes standards for air quality in regard to the pollutants generated by internal combustion engines. These standards, known as the National Ambient Air Quality Standards (NAAQS), define the concentrations of these pollutants that are allowable in air to which the general public is exposed ("ambient air").	Air Quality
Clean Water Act (CWA) (33 USC 1251 et seq.)	Section 401, the state water quality certification process, gives states the authority to grant, deny, or condition the issuance of Federal permits that may result in a discharge to the waters of the United States based on compliance with water quality standards. Section 404 regulates the discharge of pollutants, including dredged or fill material, into navigable waters of the U.S. through a permit system jointly administered by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE). Nonpoint sources requirements control pesticide runoff, forestry operations, and Parking lots/motor pools. Point sources require individual or group permits and must be monitored at the point at which they enter public waters, storm sewers, or natural waterways. Section 311 (j) requires facilities to prepare a Spill Prevention Control and Countermeasure Plan, containing minimum prevention facilities, restraints against drainage, an oil spill contingency plan, etc.	Water Resources, Biological Resources

Relevent Laws and Regulations	Summary	Affected Resource
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq.)	Provided broad Federal authority to respond directly to releases of hazardous materials that may endanger public health or the environment. Established prohibitions and requirements pertaining to closed and abandoned hazardous waste sites, provided for liability of persons responsible for releases of hazardous waste at these sites, and established a trust fund to provide for cleanup when a responsible party cannot be identified.	Hazardous Materials
Endangered Species Act (ESA) (16 USC 1531-1544)	Prohibits the harming of any species listed by the U. S. Fish and Wildlife Service (USFWS) as being either Threatened or Endangered. Harming such species includes not only directly injuring or killing them, but also disrupting the habitat on which they depend.	Biological Resources
Federal Land Policy and Management Act (43 USC et seq.)	Declares that all public lands will be retained in Federal ownership unless it is determined that a use other than public will better serve the interests of the nation. Requires that all public land be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, and environmental aspects of the land. Requires that all public lands and their resources be inventoried periodically and systematically.	All
Historic Sites Act (HSA) (16 USC 461 et seq.)	Authorizes the establishment of national historic sites, the preservation of areas of national interest, and the designation and the preservation of national historic landmarks (NHLs). Provides procedures for designation, acquisition, administration, and protection of such sites.	All
Migratory Bird Treaty Act (16 USC 703 et seq.)	Restricts the taking, possession, transportation, sale, purchase, importation, and exportation of migratory birds through permits issued by the USFWS.	Biological Resources
National Emissions Standards for Hazardous Air Pollutants (NESHAP)	Places standards on all hazardous air pollutants and governs such areas as organic liquids, asbestos, polyurethane foam, and wastewater. NESHAP is implemented under U.S. EPA jurisdiction.	Air Quality, Waste Management
National Historic Preservation Act (NHPA) (16 USC 470 et seq.)	Provides the framework for Federal review and protection of cultural resources, and ensures that they are considered during Federal project planning and execution. The implementing regulations for the Section 106 process (36 CFR Part 800) have been developed by the Advisory Council on Historic Preservation (ACHP). The Secretary of the Interior maintains a National Register of Historic Places (NRHP) and sets forth significance criteria for inclusion in the register. Cultural resources included in the NRHP, or determined eligible for inclusion, are considered "historic properties" for the purposes of consideration by Federal undertakings.	Cultural Resources
National Park Service Organic Act of 1916 (16 USC et seq.)	Established the National Park Service to manage national Parks for the purposes of conserving the scenery, natural resources, historic objects, and wildlife within the Parks, and providing for the enjoyment these resources in such manner that will leave them unimpaired for the enjoyment of future generations.	All
Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.)	Protects Native American human remains, burials, and associated burial goods.	Cultural Resources

Relevent Laws and Regulations	Summary	Affected Resource
Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.)	Regulates all aspects of the handling of hazardous waste through RCRA permits issued by the U.S. EPA.	Hazardous Materials
Safe Drinking Water Act (SDWA) (42 USC 300 et seq.)	Provides for the safety of drinking water throughout the U.S. by establishing and enforcing national drinking water quality standards. Protects public health by establishing safe limits (maximum containment limits) for contaminants based upon the quality of water at the tap, and prevents contamination of surface and ground sources of drinking water. The U.S. EPA is responsible for establishing the national standards; the States are responsible for enforcement of the standards.	Water Resources/ Quality; Human Health & Safety
Wilderness Act of 1964 (16 USC 1121 (note), 1131-1136)	Establishes the National Wilderness Preservation System. Wilderness defined as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain…which generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."	Wilderness
Executive Order 11514: Protection and Enhancement of Environmental Quality	Provides leadership for protecting and enhancing the quality of the Nation's environment to sustain and enrich human life.	All
Executive Order 11593: Protection and Enhancement of the Cultural Environment	Provides leadership for protecting, enhancing, and maintaining the quality of the Nation's historic and cultural environment.	Cultural Resources
Executive Order 12372: Intergovernmental Review of Federal Programs	Directs Federal agencies to consult with and solicit comments from state and local government officials whose jurisdictions would be affected by Federal actions.	All
Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Requires Federal actions to achieve Environmental Justice by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.	All
Executive Order 13007: Protection and Accommodation of Access To "Indian Sacred Sites"	Directs Federal agencies to consider Indian sacred sites in planning agency activities.	Cultural Resources
Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks	Requires Federal actions and policies to identify and address disproportionately adverse risks to the health and safety of children.	All

Relevent Laws and Regulations	Summary	Affected Resource
Executive Order 11990: Protection of Wetlands	An overall wetlands policy for all agencies managing Federal lands, sponsoring Federal projects, or providing Federal funds to State or local projects. It requires Federal agencies to follow avoidance/mitigation/ preservation procedures with public input before proposing new construction projects.	Water Resources, Biological Resources
Executive Order 11988: Floodplain Management	Requires all Federal agencies to take action to reduce the risk of flood loss, to restore and preserve the natural and beneficial values served by floodplains, and to minimize the impact of floods on human safety, health, and welfare. Because many wetlands are located in floodplains, Executive Order 11988 has the secondary effect of protecting wetlands.	Water Resources, Biological Resources
Executive Order 12856: Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements	Requires that the head of each Federal agency be responsible for ensuring that all necessary actions are taken for the prevention of pollution with respect to the agency's activities and facilities, and for ensuring that the agency complies with pollution prevention, emergency planning, and community right-to-know provisions.	Hazardous Materials

APPENDIX E

National Register Status of Selected Cultural Resource Sites within Apostle Islands National Lakeshore

Properties Currently Listed On National Register of Historic Places:

1. Bass Island Brownstone Company Quarry, Basswood Island
2. Devils Island Light Station
3. Hadland Fishing Camp, Rocky Island
4. Hokenson Brothers Fishery, Little Sand Bay
5. La Pointe Light Station, Long Island
6. Manitou Island Fish Camp
7. Michigan Island Light Station
8. Morty Site, Stockton Island
9. *Noquebay* Shipwreck, Stockton Island
10. Outer Island Light Station
11. P-Flat Site, Manitou Island
12. *R. G. Stewart* Shipwreck, Michigan Island
13. Raspberry Island Light Station
14. Sand Island Light Station
15. *Sevona* Cabin, Sand Island
16. Shaw Farm, Sand Island
17. Trout Point Logging Camp, Stockton Island

Properties Determined Eligible by SHPO, Nomination In Process:

18. West Bay Club, Sand Island
19. Stump-Stalker Cabin, Bear Island

District Nomination In Process:

20. Rocky Island Fishing Settlement

Included In Multiple Property Nominations, In Process:
Apostle Islands Sandstone Quarries

21. Ashland Brown Stone Company Quarry, Stockton Island
22. Breckenridge Quarry, Basswood Island
23. Excelsior Quarry, Hermit Island

Apostle Islands Logging Camps

24. Bear Island Logging Camp
25. Camp Five, Oak Island
26. Dock Site, Basswood Island
27. Lullabye Logging Camp, Otter Island
28. Lullabye Logging Camp, Outer Island
29. Quarry Bay Logging Camp, Outer Island
30. Sandspit Logging Camp, Otter Island
31. Saxine Logging Creek, Mainland
32. Schroeder Logging Camp 2, Oak Island
33. Schroeder Logging Camp, Outer Island

Elements To Be Added To Existing Sites

34. Gull Island Light Tower (to Michigan Island Light Station)
35. Nelson Cabin (to Hokenson Brothers Fishery)

Potentially Eligible, Evaluation Pending

36. Camp Stella, Sand Island
37. Campbell-Jensch Cottage, Sand Island
38. Hansen Farmstead, Sand Island
39. McCloud-Brigham Farm, Basswood Island
40. Noreng Farm, Sand Island
41. Plenty Charm Cottage, Sand Island
42. Rudd Farm, Basswood Island

Note: This table does not include archeological sites which may be determined eligible under criterion D.

APPENDIX F

LIST OF CLASSIFIED STRUCTURES AS OF 29 OCTOBER 2004

Basswood Island

Structure	Structure Number	LCS Number
Basswood Island Quarry	11106A	006384

Bear Island

Bear Island Cabin	9101A	281868

Devils Island

Structure	Structure Number	LCS Number
Devils Island Light Station Asst Keeper's Quarters	17103C	017083
Devils Island Light Station Boathouse	17106A	017098
Devils Island Light Station Cistern	17104D	101592
Devils Island Light Station Dock	17106B	017099
Devils Island Light Station Flagpole	17103M	017093
Devils Island Light Station Fog Signal Building	17103D	017084
Devils Island Light Station Hoist and Derrick Pier	17107A	101594
Devils Island Light Station Keeper's Quarters	17103B	017082
Devils Island Light Station Light Tower	17103A	017081
Devils Island Light Station Oil House #1	17103E	017085
Devils Island Light Station Oil House #2	17103F	017086
Devils Island Light Station Oil Storage Tank Complex	17103J	017090
Devils Island Light Station Oil Tank Cradles	17103K	017091
Devils Island Light Station Outer Crib	17106C	017100
Devils Island Light Station Pump House	17103G	017087
Devils Island Light Station Radio Tower	17103I	017089
Devils Island Light Station Roadway	17105A	017097
Devils Island Light Station Sidewalk	17103L	017092
Devils Island Light Station Stone Retaining Wall	17106D	101596
Devils Island Light Station Tramway	17104B	017095
Devils Island Light Station Tramway Engine Bldg	17104A	017094
Devils Island Tramway Cart	17104C	017096

Gull Island

Structure	Structure Number	LCS Number
Gull Island Lighthouse	23105A	101660

Hermit Island

Structure	Structure Number	LCS Number
Hermit Island cabin chimney	HIDIS1	294104

Little Sand Bay

Structure	Structure Number	LCS Number
Hokenson Fishery Boat "Twilite"	01138G	017077
Hokenson Fishery Box Slide	01138D	017074
Hokenson Fishery Dock	01138A	006409
Hokenson Fishery Garage	01138M	101667
Hokenson Fishery Herring Storage Shed	01138K	073300
Hokenson Fishery House	01138L	101666
Hokenson Fishery Ice House	01138B	006410
Hokenson Fishery Privy	01138C	017073
Hokenson Fishery Pump	01138E	017075
Hokenson Fishery Sidewalk	01138N	101668
Hokenson Fishery Stair	01138I	017079
Hokenson Fishery Twine Shed	01138F	006411
Hokenson Fishery Water Tank	01138O	101669
Hokenson Pile Driving Raft	01138P	102214
John Nelson Cabin	01138Q	102215
John Nelson Privy	01138R	102216
Long Island		
Chequamegon Point Lighthouse	24102B	101656
Long Island Light Station Cistern	24102G	101645
Long Island Light Station Concrete Fdtn Piers	24102K	101649
Long Island Light Station Fog Signal Building Fdtn	24102E	101642
Long Island Light Station Old Keeper's Quarters	24102A	101651
Long Island Light Station Old Oil House	24102I	101652
Long Island Light Station Power Lines	24102D	101655
Long Island Light Station Radio Tower Pier Fdtn	24102D	101646
Long Island Light Station Sidewalks	24102H	101644
Long Island Light Station Tower	24102F	101643
Long Island Light Station Triplex	24101A	101647
Long Island Light Station Yellow Oil House	24101B	101648

Manitou Island

Structure	Structure Number	LCS Number
Manitou Camp Bunkhouse	14-104-C	022608
Manitou Camp Dock	14-104-I	022613
Manitou Camp "Governor's" Cabin	14-104-A	022606
Manitou Camp Ice Fishing Cabin	14-104-E	022610
Manitou Camp Net Drying Reels	14104K	101560
Manitou Camp Privy	14-104-F	022611
Manitou Camp Smokehouse	14-104-H	022612
Manitou Camp Twine Shed #1	14-104-B	022607
Manitou Camp Twine Shed #2	14-104-D	022609
Manitou Camp Windlass	14-104-J	022614

Michigan Island

Structure	Structure Number	LCS Number
Michigan Is. Light Station Assist Keepers Apt/Workshop	23103F	006388
Michigan Island Light Station Concrete Sidewalks	23103H	101135
Michigan Island Light Station First Tower and Keepers Quarters	23103A	006371
Michigan Island Light Station Keeper's Quarters	23103G	006389
Michigan Island Light Station Power House	23103D	006386
Michigan Island Light Station Privy	23103C	006385
Michigan Island Light Station Radio Beacons	23103I	101136
Michigan Island Light Station Second Tower	23104A	006372
Michigan Island Light Station Shed	23103B	006373
Michigan Island Light Station Steps/Tramway	23103E	006387

Outer Island

Structure	Structure Number	LCS Number
Outer Is Light Station Concrete Cradle Underground Storage	22104F	101141
Outer Island Light Station Brick Outhouse	22104D	006380
Outer Island Light Station Dock	22104A	006377
Outer Island Light Station Flagpole	22106A	101145
Outer Island Light Station Fog Signal Building	22104B	006378
Outer Island Light Station Keepers Quarters	22105B	101140
Outer Island Light Station Light Tower	22105A	006376
Outer Island Light Station Oil House	22104C	006379
Outer Island Light Station Oil Tank Cradles	22104G	101142
Outer Island Light Station Sidewalks	22104H	101143
Outer Island Light Station Steps/Tramway	22104E	101137

Raspberry Island

Structure	Structure Number	LCS Number
Raspberry Island Light Stat Asst Keeper's Privy	08102D	006394
Raspberry Island Light Stat Concrete Oil Cradles	08104E	101627
Raspberry Island Light Stat Lighthouse and Keeper's Quarters	08103A	006390
Raspberry Island Light Station Barn	08102C	006393
Raspberry Island Light Station Boat House	08102K	101623
Raspberry Island Light Station Cistern	08104C	101628
Raspberry Island Light Station Dock	08102A	006391
Raspberry Island Light Station Fog Signal Building	08102B	006392
Raspberry Island Light Station Keeper's Privy	08102E	006395
Raspberry Island Light Station Oil Building	08102H	006375
Raspberry Island Light Station Shed #1	08102G	006374
Raspberry Island Light Station Shed #2	08102F	006396
Raspberry Island Light Station Sidewalks	08104A	101630
Raspberry Island Light Station Steps/Tramway	08104B	101624

Rocky Island

Structure	Structure Number	LCS Number
Benson Family Cabin	16104C	101603
Benson Privy	16104D	101605
Bernhard's Cabin (Benson)	16104B	101600
Charlie Benson's Fish House	16104A	101598
Edward's Cabin (Nelson)	16106C	101616
Erickson Main Cabin	16108B	101621
Erickson Privy	16108C	101622
Erickson Storage Shed	16108A	101620
Hadland Fishing Camp Cabin - Building A	16103A	006397
Hadland Fishing Camp Family Camp Ruin	16103B	006398
Hadland Fishing Camp Net Reels	16103F	006402
John Fried Cabin (Hadland Fishing Camp)	16103C	006399
Jones Main Cabin	16105A	101608
Jones Privy	16105B	101610
Lynn's Cabin (Chapin)	16107A	101613
Mildred's Cabin (Benson)	16104E	101606
Nelson Living Cabin	16106A	101614
Nelson Metal Storage Building	16106B	101615
Nelson Net Drying Rack	16106F	101619
Nelson Privy	16106D	101617
Nelson Wood Storage Shed	16106E	101618
Norman's Cabin	16105C	101612

Sand Island

Structure	Structure Number	LCS Number
Burt Hill Log Cabin (Shaw-Hill Farm)	06143F	006408
Camp Stella Cabin #1	06143S	101568
Camp Stella Cabin #2	06143P	101569
Camp Stella Cabin #3	06143G	101570
Camp Stella Cabin #4	06143N	101571
Camp Stella Foundation/Pumphouse	06143Q	101573
Camp Stella Ice House	06143R	101572
Camp Stella Kitchen	06143M	101567
Camp Stella Light Post	06143L	101565
Camp Stella Porched Cottage	06143I	101564
Camp Stella Sevona Cabin	06143A	006403
Camp Stella Sleeping Cottage	06143O	101566
Campbell-Jensch House	06147A	101574
Campbell-Jensch Pump	06147C	101576
Campbell-Jensch Shed	06147B	101575
Hansen Boar's Nest	06146F	101582
Hansen Guest House	06146B	101578
Hansen Ice House	06146E	101581
Hansen Machine Shed	06146C	101579
Hansen Main House	06146A	101577
Hansen Twine Storage Shed	06146G	101583
Hansen Wood Shed	06146D	101580
Sand Island County Road	06148A	101593
Sand Island Light Station and Keeper's Quarters	06142A	006381
Sand Island Light Station Concrete Walkways	06142D	101558
Sand Island Light Station Oil House	06142B	006382
Sand Island Light Station Privy	06142C	006383
Shaw-Hill Farm Grain Building	06143H	101562
Shaw-Hill Farm Main House	06143C	006405
Shaw-Hill Farm Privy	06143J	101559
Shaw-Hill Farm Smokehouse	06143D	006406
Shaw-Hill Farm Workshop	06143E	006407
Shaw-Hill Post Office	06143B	006404
West Bay Club	06144C	101586
West Bay Club Concrete Steps/Sidewalk	06144B	101585
West Bay Club Ice House	06144A	101584
West Bay Club Shed	06144D	101587

Appendix G

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Appendix H

Flora and Fauna Scientific Names for Species Mentioned in this Document

Common Name	Scientific Name
Tree Species	
Balsam Fir	*Abies balsamea*
Red Maple	*Acer rubrum*
Sugar Maple	*Acer saccharum*
Yellow Birch	*Betula alleghaniensis*
Paper Birch	*Betula papyrifera*
White Ash	*Fraxinus americana*
Tamarack	*Larix laricina*
Black Spruce	*Picea nigra*
Jack Pine	*Pinus banksiana*
Red Pine	*Pinus resinosa*
White Pine	*Pinus strobus*
Bigtooth Aspen	*Populus grandidentata*
Quaking Aspen	*Populus tremuloides*
Northern Red Oak	*Quercus rubra*
Northern White Cedar	*Thuja occidentalis*
Basswood	*Tilia americana*
Eastern Hemlock	*Tsuga canadensis*
Balsam-poplar	*Populus basamifera*
Shrub Species	
Speckled Alder	*Alnus rugosa*
Juneberry	*Amelanchier species*
Bearberry	*Arctostaphylos uva-ursi*
Huckleberry	*Baylussacia baccata*
Leatherleaf	*Chamaedaphne calyculata*
Bunchberry	*Cornus canadensis*
Red-osier dogwood	*Cornus sericea*
Beaked Hazelnut	*Corylus cornuta*
Creeping Snowberry	*Gaultheria hispidula*
Wintergreen	*Gaultheria procumbens*
Common Juniper	*Juniperus communis*
Labrador Tea	*Ledum groenlandicum*
Twinflower	*Linnaea borealis*
Fly Honeysuckle	*Lonicera xylosteum*
Partridgeberry	*Mitchella repens*
Bracken Fern	*Pteridia aquilinum*
Skunk Current	*Ribes grandulosum*
Swamp Red Current	*Ribes triste*
Showy Mountain Ash	*Sorbus decora*
Canada Yew	*Taxus canadensis*

Common Name	Scientific Name
Blueberry	*Vaccinium angustifolium*
Small Cranberry	*Vaccinium oxycoccos*
Fern, Forb, Grass, and Sedge Species	
Yarrow	*Achillea millefolium*
Wild Sarsaparilla	*Aralia nudicaulis*
Lake cress	*Armoracia lacustris*
Moonwort	*Botrychium lunaria*
Calypso orchid	*Calypso bulbosa*
Calypso orchid	*Calypso bulbosa*
Calypso orchid	*Calypso bulbosa*
Harebell	*Campanula rotundifolia*
Beautiful sedge	*Carex concinna*
Coast sedge	*Carex exilis*
Shore sedge	*Carex lenticularis*
Michaux's sedge	*Carex michauxiana*
Drooping sedge	*Carex prasina*
Sedge species	*Carex spp.*
Goldthread	*Coptis groenlandica*
Bluebead Lily	*Cornus canadensis*
Pink Lady’s Slipper	*Cypripedium acaule*
Sundew species	*Drosera spp.*
Wood Ferns	*Dryoperus spp.*
Willow-herb species	*Epilobium spp.*
Fireweed	*Epilobium angustifolium*
Horseweed	*Erigeron canadensis*
Russet cottongrass	*Erirophorum chamissonis*
Wood strawberry	*Fragaria vesca*
Wild strawberry	*Fragaria virginiana*
Club Moss species	*Huperzia spp*
Spotted touch-me-not	*Impatiens capensis*
Broad-lipped twayblade	*Listera convallerioides convallarioides*
Brook lobelia	*Lobelia kalmii*
Bugleweed	*Lycopus uniflorus*
Yellow Loosestrife	*Lysimachia terrestris*
Tufted Loosestrife	*Lysimachia thrysiflora*
Canada mayflower	*Maianthamum canadense*
Cow-wheat	*Melampyrum lineare*
Naked miterwort	*Mitella nudens*
Marsh grass-of-parnassus	*Parnassia palustris*
Ninebark	*Physocarpus opulifolius*
Butterwort	*Pinguicula vulgaris*
Fringed polygala	*Polygala paucifolia*
Swamp cinquefoil	*Potentilla palustris*

Common Name	Scientific Name
Three-toothed cinquefoil.	*Potentilla tridentate*
Bird's-eye primrose	*Primula laurentiana*
Northern Gooseberry	*Ribes oxyacanthoides*
Satiny willow	*Salix pellita*
Flat-leaved willow	*Salix planifolia*
Pitcher plant	*Sarracenia purpurea*
Skullcap species	*Scutelaria spp.*
Plains ragwort	*Senecio indecorus*
Canada goldenrod	*Solidago canadense*
Grass-leaved goldenrod	*Solidago graminifolia*
Sphagnum species	*Sphagnum spp.*
Meadowsweet species	*Spiraea spp.*
Starflower	*Trientalis borealis*
Spike trisetum	*Trisetum spicatum*
Mountain cranberry	*Vaccinium vitis-idaea*
Violet species	*Viola spp.*

Bird Species	
Piping Plover	*Charadrius melodus*
Peregrine Falcon	*Falco peregrinus*
Bald Eagle	*Haliaeetus leucocephalus*
Mammal Species	
Gray Wolf	*Canis lupus*
Beaver	*Castor canadensis*
Porcupine	*Erethizon dorsatum*
Lynx	*Lynx canadensis*
Striped Skunk	*Mephitus mephitus*
White-tailed Deer	*Odocoileus virginianus*
Least Chipmunk	*Tamias minimus*
Eastern Chipmunk	*Tamias striatus*
Black Bear	*Ursus Americana*

Appendix I

Special Concern Species

Vascular plants occurring in Apostle Islands National Lakeshore and Madeline Island that are listed by the Wisconsin Department of Natural Resources as being of "special concern."

Common Name	Scientific Name
Dragonmouth	*Arethusa bulbosa*
Lance-leaved grape-fern	*Botrychium lanceolatum*
Mingan moonwort	*Botrychium minganense*
Small grape-fern	*Botrychium simplex*
Bog reed-grass	*Calamagrostis inexpansa*
Hair-like sedge	*Carex capillaris*
Pale sedge	*Carex pallescens*
Sparse-flowered sedge	*Carex tenuiflora*
Tufted hairgrass	*Deschampsia cespitosa*
Common hairgrass	*Deschampsia flexuosa*
Spreading wood fern	*Dryopteris expansa*
Robbins spike-rush	*Eleocharis robinsii*
Marsh horsetail	*Equisetum palustre*
Variegated scouring rush	*Equisetum variegatum*
Woodland cudweed	*Gnaphalium sylvaticum*
Fir clubmoss	*Lycopodium selago*
Adder's tongue	*Ophioglossum pusillum*
Chilean sweet cicely	*Osmorhiza chilensis*
Tall white orchid	*Platanthera dilatata*
Round-leaved orchid	*Platanthera orbiculata*
Bird's-eye primrose	*Primula mistassinica*
Sooty beakrush	*Rhynchospora fusca*
Plains ragwort	*Senecio indecorus*
Small purple bladderwort	*Utricularia resupinata*
White mandarin	*Streptopus amplexfloius*
Livid sedge	*Carex livida var. radicaulis*
Small yellow water-lily	*Nuphar microphyllum*
Northern black currant	*Ribes hudsonianum*
Torrey's rush	*Scirpus torreyii*

Appendix J

Comments on the EA and Responses to Comments